Title       An Investigation of the Variables Affecting
Patient Prosthetic Satisfaction

Name       R D Gravelle

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AN INVESTIGATION OF THE VARIABLES AFFECTING
PATIENT PROSTHETIC SATISFACTION

by

R. D. GRAVELLE

A thesis submitted for the degree of Doctor of Philosophy
of the University of Luton.

2003
ABSTRACT.

Through whatever misfortune people have always had the need for artificial limbs. This study questions current thinking in the field of prosthetics, aiming to address the most prevalent issues affecting the amputee today, such as, fit, comfort and practicality, which have an inarguable baring on patient prostheses satisfaction.

Through examination, more obscure problems encountered by users were explained, indicating how design issues and methodologies affect the present and future manufacturing process. As a result of this research a development model for the increased effectiveness of prostheses fitment and improvements in patient prosthetic satisfaction have been made. This has included suggestions for potential improvements in limb fitting center protocol, patient education and awareness strategies for the assessment of delivered patient needs and requirements.

Methods implemented during the research consisted of a comprehensive literature review of current information, technical reports and patient satisfaction findings and assessment techniques. This was accompanied with an investigation and evaluation of the prosthetics industry, including limb fitting, patient requirements, product/service shortfalls, rehabilitation technique and patient lifestyle. Additionally interviews and questionnaires with practitioners and users were undertaken aiding the evaluation of patient satisfaction and the identification of potential improvements in artificial limb fitment procedure.

The results revealed several areas that deserved more detailed investigation, notably relating to the hypotheses, that the relationship between the levels of fit, comfort and practicality archived within the prostheses has an effect on the patient’s satisfaction. Through the examination of this main hypothesis one of the most significant factors which emerged was the effect of the communication level held between the patient and prosthetist. The results of this enquiry indicated that improved patient knowledge with respect of their situation and an increased ability to accurately relay issues of concern to the prosthetist, facilitated the delivery of satisfactory prostheses, in turn improving its fit, comfort and practicality.

In conclusion, previous conjecture as to the limited effectiveness of current prosthetics in re-establishing patients activity levels were assessed, and suggestions generated by the results of patients dissatisfaction with their limbs. These findings facilitated the realisation of new educational, protocol-based methodologies, tools and theories.
“To my future wife and family.”
PREFACE

The reason for undertaking of this study was to further the researcher’s understanding of the field of prosthetics in terms of design and human factors analysis, suggesting, identifying and recommending potential improvements in the design and fitment procedure of artificial limbs. This it was intended to improve the understanding and recognition of the prosthetics user’s needs, easing and enhancing their way of life, eliminating previously problematic areas and reducing the effects of their disability.

This intentions however, would not have been possible without the continued support of many generous contributors. These include the numerous staff and students at both DeMontfort University and Luton University, in particular Dr Richard Davis my second supervisor and my first supervisor Dr Joseph Amoah – Nyako, whose tutorials on research theories, methodologies, constructive reading and general encouragement has enabled me to achieve the doctoral objective.

Special thanks to all the staff at the Leicester general NHS Trust hospital especially Mrs Sue Marriott and the staff at Luton & Dunstable NHS Trust hospital especially Mrs Ann White, for their willingness and interest to conduct the study within their limb centres.

I am particularly indebted to my partner Rebecca and my parents who throughout have provided financial and practical support. Without their help and concern this study would have not been possible.

Finally I would like to thank the all the charitable organisations that have provided financial assistance during this study, including -

Ben – Motor and Allied traders Benevolent Fund,
British Association of Health Services in Higher Education,
Leicester Charity Organisation,
Leicester General Charities,
Snowdon award,
The Harry James Riddleston Charity of Leicester,
The James Pantffedwen Foundation,
DECLARATION

I declare that this thesis is my own unaided work. It is being submitted for the degree of Doctor of Philosophy at the University of Luton. It has not been submitted before for any degree or examination in any university.

Robert David Gravelle

Friday 29th August, 2003
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CHAPTER 1

INTRODUCTION: THE RELATIONSHIP BETWEEN USER SATISFACTION AND THE PROSTHETIC LIMB

1.1 Study Aim

The main aim of this study is to assess the current suitability of the products delivered by the British limb fitting service as perceived by the patient. Thus improving the quality, functionality and appropriateness of the delivered prosthesis to the patient within the confines of the British National Health Service.

1.2 Key Research Question & Main Hypothesis

The key research question involved in this study can be defined in the following statement “what are the main issues that affect patient prosthesis satisfaction and do prostheses currently delivered by British National Health Service limb fitting centres address patient needs and satisfy patient requirements.”

The investigation into this research question will consist of an inquiry into the main issues that effect patient satisfaction with their prosthesis and limb fitting process. Questioning at all stages including the limb fitting process, amputation, fitment procedure, rehabilitation and lifestyle, the effects and implications as reported by the patient of being a prosthetic user.
This will be examined through the use of the following main hypothesis:

- There is a relationship between the fit, comfort and practicality and patients’ satisfaction with prosthetic limb.

1.3 Study Objectives

The primary objective of this study is to identify and recommend potential improvements in the design and fitment procedure of artificial limbs, by attempting to produce a methodology for artificial limb design. These improvements will inevitably improve the users way of life thus eliminating previously problematic areas and reducing the effects of their disability.

Central to this study will be the evaluation of opinions and experiences of prosthetic users, gauged by means of questionnaires and case studies, allowing clarification and examination of their main problems. The direct motivation of this research is the evaluation of the key areas in which prosthetics design is underestimating or not fulfilling the needs of the users. The literature review revealed that such an approach had not previously been undertaken.

1.4 Study Beneficiaries

It is foreseen that the outcomes of this study will not only address the concerns expressed by the prosthetics user but will improve the level of deliverable standards achieved by the limb fitting centre staff at all levels.
The main beneficiaries of the study’s outcomes will gain differing insights into the needs of the amputee and the services necessary to adequately deliver consistently higher levels of customer satisfaction, improving standards across the center. Managerial staff will gain insight into the identification of shortfalls within the centre’s service, which can be addressed in an economic, service and educationally based manner.

The prosthетists will gain an increased awareness of the differing needs of the patient, allowing them to systematically educate the patient about their situation aiding interaction and the transfer of ideas, concerns and problems between both parties.

As a result of the increased understanding of patient needs, it is expected that patients will become more confident in expressing problems with their prosthetic during the fitting process. This will improve the prosthetics fit, comfort and practicality leading to more favourable solutions and higher levels of patient satisfaction.

It is expected that improved patient satisfaction and prosthetics quality will reduce the economic implications and pressures on the limb fitting center, improving many facets of the service. Including, a reduction in the time that it takes to produce a satisfactory limb, the time that the patient spends within the limb fitting center and decreased patient waiting lists, allowing for treatment of higher numbers of patients in a shorter period of time.
Artificial limbs have been a necessity over the centuries due to natural or artificial circumstances. Prosthetics has been developed as a means of correcting the perceived disability from the perspective of the able bodied community. This research examines current thinking in the field of prosthetics and aims to address the three most prevalent issues affecting the amputee and prosthetics user today, fit, comfort, and practicality. These three issues have been argued to impact on a patient’s psyche. Research to date has overlooked these issues with attention mainly being focused on the areas of materials and technologies to remedy the problems (Uellendahl, 1998; Fillauer, 1999).

A prosthetic comprises a number of elements, the socket, pylon, ankle and foot. The design of each element of the prosthetic has an equal importance in the attainment of user limb comfort. It appears however, from the initial literature review, that some of the significant physical needs of the user have been neglected with technology driving improvement rather than producing solutions to patients’ usage problems (Garrett, 1997). The dismissal of patient requirements has not only been derived from the approach of the medical community to patient care, but has also emerged from a lack of understanding of the relationship between user and prosthetist (Williams, 1997). This observation is confirmed by Legro et al (1999), who through their investigations into the psychological issues prevalent in the prosthetics user have provoked debate and modified current thinking on the subject. However, these studies fail to attempt to itemise the myriad of sub-variables such as stump volume and amputation orientation, that seem to affect user reaction or satisfaction to their prosthetic.
In addition there seems to be an argument in the categorization of the three main psychological issues relating to the user acceptance of a prosthetic. Firstly their inward perception of themselves and their body image, how he/she feels about themselves. Secondly the outward, what they perceive others to think about their disability, and thirdly, the limiting effects of our environment. All of these impact, on freedom of choice and movement.

Sometimes the unsuitability and limited effectiveness of the prosthetic combined with the psychological impact of being a disabled person, has great repercussions on the physical well being of the patient. Issues of mobility can be created through ill-fitting limbs, which leads to the inability to walk, and consequently dermatological or circulatory problems. The whole issue of the practicality and use of the prosthetic from donning to doffing the limb, further impacts on the routine quality of life.

The effects on quality of life can also act as a catalyst for many potential psychological issues. Issues of low self esteem, confidence, and vulnerability are a consequence from the lack of personal interaction within social activities.

Past research has also concentrated on the mechanical areas of prosthetics, bringing about huge improvements in all areas of the field but most notably in user mobility, posture and walk dynamic. Recently, however, other factors such as amputation level and its effect on balance influencing the user’s ability to walk more naturally have been investigated (Nicolas et al, 1993).
For the amputee these factors define their everyday life, yet traditional methods of limb fitting frequently fail to produce the desired fit or to combat comfort and practicality issues. Issues which until now have been viewed as having little or no effect on the users' quality of life and occurring as a direct result of being an amputee (Folkerts, 1997).

Although many studies have attempted to localise the areas of concern (Pruitt et al., 1997) specified by prosthetics users and isolated the variables, few have attempted to explore these areas in terms of their applicability as tools for design development. Overlooking the implications of the sub-variables of environment, age, amputation level, gender, and education level.

Due to the lack of empirical evaluation of the main issues affecting the amputee patient’s level of satisfaction with their prostheses and the apparent lack of understanding of user requirements, the design of several aspects of the prostheses appear to be unsatisfactory.

As a result, this study will investigate the impact between the issues identified by the patient and the level of patient satisfaction with their prostheses.

1.6 Research Method

Several methods have been used to localise and isolate the areas of concern specified by prosthetics users (Pruitt et al., 1997) but few as illustrated previously have explored these issues in terms that can be used as tools for design development.
Early investigation through literature review of the problems affecting the amputee/prosthetics user suggest that three factors are of most concern, that of the fit, comfort and practicality of the prosthetic. These three factors, fit comfort and practicality were used as the main variables of this study. Furthermore, it was found that these factors were linked to the psychological profile of the user as they dictate impressions of body image and impact on levels and type of activity. Therefore possibly tainting their personal responses towards their situation as a disabled person. Additionally it was found that the prosthetic user response and functional ability to in comparison to their able bodied peers was an indicator of prosthetic use as well as relating to patient prosthetic satisfaction.

The examination of the literature within the subject area of prosthetics and its complimentary fields led to the identification of three main factors, and the itemisation of the core elements and sub variables within the main factors of fit, comfort, practicality.

This research is an amalgamation of several methodologies under the title of scientific research, starting with a process of technique evaluation, based on similar studies in the field and their findings, evaluating techniques such as interview, observational, case study and questionnaire (Orna and Stevenes, 1995).

Upon satisfactory evaluation, it was found that the most suitable technique was the questionnaire. Primarily based on evidence that suggested that research conducted through interviews and observation would possibly be, or become, influenced by the
researcher as a result of personal involvement, with the interviewee becoming inadvertently guided to give responses that were desirable to the study, therefore creating bias (Kumar, 1999).

Furthermore it was decided that the study would use patients as the target for questioning and investigation because they generally had no representation on the design teams or medical staff within the limb fitting centres and in turn had no influence behind the decision making process. This allowed for the gathering of data that was unbiased truly reporting issues of concern as recognized by the patient.

This was accompanied by a detailed review of all facets of the prosthetics field, undertaken to aid the establishment of variables for testing and sub-variables for validation. Specific areas of concern concentrated on aspects of patient satisfaction with prosthetic devices and or their disability and external contributing factors of importance to the amputee, such as lifestyle, level of amputation and activity levels.

1.7 Study Focus

The focus is on the patient providing a source for data collection on the subjective measurements of levels of prosthetic satisfaction. This will encompass users’ perception and attitudes towards the objective measurements (measurements of fit, comfort and practicality). The patient’s background details including age, sex, income level etc will be used as objective measurements. This will be conducted in two NHS hospital trusts, Leicester General and Luton & Dunstable General due to their comparative patient numbers, patient types, demographics and cultural similarities.
1.8 Structure of Thesis

Chapter 1 is the general introduction explaining the overall issues originating this study. Chapter 2, consists of a detailed examination of the background behind the concept of disability, identifying differing historical concepts of the term and factors that possibly affect the disabled person’s perception of themselves and the perceptions of disability held by others. It also includes an investigation of the factors behind the apparent search for what is a preconceived ideal that of being “normal”, and the influences of disability on the disabled person and the necessity of prosthetic advancement.

Chapter 3, summaries the factors and process involved in the fitting of a new prostheses. Chapter 4, identifies associated problems with issues of amputation and prosthetic adaptation using historic case studies and examples to illustrate the impetus behind prosthetics development. Chapter 5, illustrates the modern prosthetics field, focusing on the issues that impact on the design and construction of lower limb prosthetics, giving particular consideration to the below knee user. Concentrating on issues of patient prosthetic satisfaction and to what degree patients needs and preferences are met.

Chapter 6, explains the reasons behind the utilised research methodology adopted to test identified hypothesis, in addition to explaining the criteria by which the chosen case studies were identified and the techniques used in previous studies in the prosthetics field. Chapter 7, explores the strength of the relationship held between the three main variables under investigation identified from the literature review, namely
fit, comfort and practicality. Searching for any possible connection they may have with the relationship between patient and prosthetist and its impact on patient prosthetist. This will include investigation of background factors pertaining to the patients, financial security, age, sex, education level and so on. These data were statistically analysed via crosstabulations, frequencies and correlation’s identifying possible relationships.

Chapter 8, analyses the relationship between the design variables illustrated in chapter 7 so as to test the hypotheses. Finally Chapter 9, is the summary and conclusions in which general research findings are discussed and are related to the original problems identified.

1.9 Importance and Reason for Investigation

The importance of this investigation is that although research to date has improved many factors with regard to the materials and technology of prosthetics development it is clear that some of the significant physical needs of the user have been neglected. This has resulted from the medical community’s approach to patient care with a neglect of the relationship between user and prosthetist, and a failure to itemise the sub-variables of interest to the amputees and their affect on satisfaction levels.

Through the identification of some of these issues of interest to the patient there is no reason at all that patient satisfaction, quality of prosthetic service and limb fitting in general cannot be improved. This will lead to an improved patient quality of life and a more tailored approach to the limb fitting process.
CHAPTER 2

AN ASSESSMENT OF THE IMPACT OF DISABILITY

2.1 Disability An Introduction

In order to understand the evolution and development of the artificial limb or prosthetic, it is important to consider the origins.

The definition of disability as defined by the Oxford Dictionary is "thing or lack that prevents one’s doing something; legal disqualification; physical incapacity caused by injury or disease (Oxford Dictionary, 1984). However, this and other similar definitions are quickly becoming obsolete, with the prejudice, fear, and exclusion of the disabled slowly but surely being overcome. For centuries those with some form of disability have been the objects of pity and fear often being the victims of segregation and institutionalisation, due to the illiberal assumption that the disabled are incapable and unable to enjoy or participate in life.

This expectation within some cultures and societies led to the view that the disabled are unable to participate in activities, as menial as day to day work, or hold down a permanent job. In the past some have had to hide their disability in order to achieve their goals. Franklin Roosevelt, hid the fact that he had polio, which resulted in him being unable to walk unassisted. One of the greatest figures in twentieth century history did not reveal his disability for fear that it would lead to prejudice and prevent
his advancement, in fact he became President of the United States of America (Hent and Quinlan, 1996).

Today these attitudes are being challenged with the affirmation that people with disabilities are no different from the able bodied and the argument that we are all disabled to some degree being increasingly accepted (Enns, 1982).

Although perception is changing in many areas of society as a result of new legislation and a more visibly active and challenging approach by the disabled the stereotypes and pigeonholing die-hard.

Only through better understanding of what it is to be disabled and what is needed by a disabled person, will society properly develop and advance prosthetics technology. In the future it is hoped that the level of technology and social expectance will empower users creating comparisons with more commonly found disabilities such as short-sightedness, with the donning of a prosthetic becoming akin to placing spectacles on ones nose.

2.2 The Classification Of Disability

The physical appearance of the human body which comes in a myriad of variations, has historically defined social class and standing. However our bodies intrinsically have not created this phenomenon but rather society’s attitudes towards difference and otherness, today commonly known as disability.
The defining of social stature has lead to the creation of a norm, with those falling outside that norm, being referred to as other or 'Disabled' with the severity of the disability allowing for its categorization and measurement.

The severity of the disability has been further marginalised by those who themselves are on the peripheral of society. Models of segregation that can be found in most western cultures and social hierarchy are by no means unusual, but rather are expected. Inclusion is rare, however, among the Maori in Aotearoa, other-ness is celebrated and disability accepted as the norm. Historically in the western world disability has generated several models that can be neatly classified into socially understandable and acceptable terms (Clapton and Fitzgerald, 1997).

2.3 Classification of Disability – Models

Disability can be categorized in three main models, the religious model, the medical/genetic model and the rights based model. Each model has evolved in sophistication over the centuries, reinforcing, encouraging and condoning, what are often negative response to the disabled.

2.3.1 The Religious Model

The western Christian overview of disability created from biblical texts is somewhat confused, with references being taken somewhat literally. One variant, although most prevalent in the Dark Ages, but still embraced by some today, suggests that disability
is the embodiment of evil spirits, the devil, witchcraft or even God's displeasure (Clapton and Fitzgerald, 1997).

However an alternative, more comfortable reading of such references suggests that the disabled are the embodiment or reflection of the "suffering Christ" perceived often as angelic or beyond-human status, and as a blessing for others.

It can be argued that human reaction to the condition known as disability is often based on several conceptualised factors, such as impurity, Christian sin, weakness, healing and burden. However this orderly categorization under one term has not always been the case, with more derogatory descriptions, such as crippled, dumb, idiot, deaf, lame, feeble, imbecile and moron being used. Such terms have not just been isolated to one particular disadvantaged group but, have often been used as a general description.

In other societies such as the Normadic and/or Agarian (Clapton and Fitzgerald, 1997) the disabled were perceived as a burden to all. The fortunate were used within the family and assigned jobs within their capabilities, thus keeping them active and fulfilling co-operative survival. Those considered disabled were ostracised, unworthy of human status and were labelled monsters, becoming homeless through no other reason but poverty and shame, for example the fate of the Hunch-back of Notre Dame (Hugo, 1833).

Religious communities responses varied, some searched for cures, exorcisms, purging, rituals and so on, others used more human approaches such as hospitalisation.
acts of mercy and the Christian duty to "needy strangers" (Enns 1982). Currently these approaches are changing as a result of the modern influences. Enlightenment through industrialisation and medical advancement have challenged religious modes values with reasoning and rationality.

2.3.2 The Medical Model

From an historical religious perspective the roles of priests and custodians diminished, as a result of medical scientific enlightenment, the doctor and scientist became feared and revered.

This expansion in knowledge created a difference in the perception of time itself resulting in the commodification of work and production. Human worth was then to be reduced to work value and profitability. Mechanical practices and institutions of the state dictated lives and lifestyles. The needs of society as a whole replaced the needs of the individual, logic replaced mystery, knowledge replaced human instinct and unfounded belief.

Through this social metamorphosis ‘Normality’ became determined by the idea of the white, young, able, male, with any deviation from the perceived ideal norm becoming hierarchically categorized and placed as inferior. Therefore difference becoming redefined as a deviation from the norm thus needing to be controlled.

Events and in-doctrines of this era had a major impact on the lives of those with body limitations and varying disabilities. These people and their lives were reduced to
medical labels, with futures defined under medical prognosis. This led to people with
disabilities becoming a greater subclass than ever before, requiring their physical
removal from society and the “able bodied”. Developing norms were a precursor to
urbanised society and its values. As some commentators have noted this was the era
when cripples disappeared and the disabled were created.

As certain sub-classes were becoming viewed as unproductive and incapable,
institutions were established. Having dual purposes these institutions served two roles
one being to alleviate the burden placed upon active members of society thus allowing
them to meet their own obligations as workers and two being a tool by which the
disabled could be skilled so as to become productive members of society.

Yet with this modern era there was also this increased knowledge and emphasis on the
scientific approach and the introduction of Darwinian philosophies following
Darwin’s publication of the ‘On the Origin of the Species” (Darwin, 1859). As a
result such special institutions caring for the needs of the social outcast, evolved from
reform to agents of custody reinforcing social control and becoming tools of
segregation for those now described as sub-normal.

Institutions became the vanguard by which social cleansing could be accomplished,
under the assumed guise of science. Care for the disabled focused on the notion that
they were a helpless, dependent, a burden, tragically stricken by a medical problem.
This led institutions to adopt singular care strategies with similar technical and
professional opinions.
In the post-industrial era, enlightenment in western society has led disability to be regarded as an individual affliction determined by scientific and medical circles. Therefore “disability” has been defined as a non argumentative state, being described as a objective observable attitude or characteristic of an afflicted person. If this statement is used to describe disability, at that time, it is fair to say that the individual is the problem even though there have been interventions aimed to equip the person with the necessary skills to rehabilitate or to deal with society. However, in a western culture supported by scientific and medical reasoning, where the idea of the body is as a shrine, objectified and controlled, those in sub-groups can only be perceived as failures as result of their limited bodily control.

2.3.3 The Rights Based Model – 1970’s

The emergence and influence of integration philosophies in the 1970’s changed the focus of care concepts based on state-run institutions to individual care facilities based in the community. However this change into more community based care homes has still fallen short of the true aim of disabled integration, which should consist of the disabled person being as fully independent as possible.

This is as a result of the medical perception of disability being related to the economic costs of care. This observation is based on the state benefit system, which still relies on principles from the industrial revolution. Principles whereby capacity and ability were assessed in derogatory terms, establishing limitations in order to gain financial assistance and benefits (Clapton and Fitzgerald, 1997).
This economically controlled view of disability has created a very blinkered appreciation and approach. With the disabled person often being thought of in terms of limitations and restrictions with the fundamental implication being whether such handicapped people can be educated and be productive in the community. This attitude has greater repercussions on the disabled person than even their physical challenges.

This lack of physical and virtual access to resources, then further demoralises minorities, with the only source of help often being charities, perpetuating the disabled as being in need of help, objects of pity, tragic dependants, eternal infants.

This outlook is in comparison with the early Christian response where social standing would command attitude and response. Negative in the lower social classes with disability being a curse or judgement, and complementary in upper socially affluent groups (Clapton and Fitzgerald, 1997).

Arguably however, the attitudes and reactions of pity and charity are still held by social groups, but increasingly common is the notion that disability is conceptualised as a political tool under the umbrella of the human rights movement. Through this the influence has truly changed to one of independents rather than dependence.

This is largely due to the voice of the disabled being heard in political circles, becoming active against "social disabled discrimination". Today the disabled have a voice of their own, involving themselves in identity politics, demanding the same civil rights as that accorded to sexism and racism. Although these tactics have brought their
plight to the public eye with definite gain, they have in some respects been very limited.

2.3.4 The Rights Based Model –1980’s

Since the 1980’s a conceptual change in the way that society thinks of disability has emerged (Clapton and Fitzgerald, 1997). Pioneered in Australia, this change is based on the premise that disability is a larger issue than the medical definition, it suggests that disability is a problem based in community participation. Access to the everyday activities that most people take for granted such as education, social activities, recreation and even employment have been identified as being a larger contributory factor towards disability than at first thought (Clapton and Fitzgerald, 1997). Circumstances that prohibit or restrict the right of the disabled person to freedom of movement or interaction on any level, be it physical or intellectual. Legislation has been introduced to combat and re-align unfair situations promoting people’s rights.

As previously stated in section 2.3.3, disability has become yet another political tool, which in this case has improved and amended many issues that had restricted and even institutionalised the disabled. This acceptability although primarily positive has its own drawbacks, resulting in people with disabilities being locked into the membership of a sub-group or minority due sometimes to self enforced exile. Finally although legislation has been put into place to amend the issues indicated within this section guaranteeing the disabled rights, financial and physical aid, their entitlement to become a member of the community remains elusive.
2.3.5 Disability The Future

Although disability has been positively affected by rights based discourse, and governmental intervention, no significant alteration to the definition of disability has occurred, so, despite these legislative changes, it appears that little in the lives of the disabled has changed.

It is true to say that in-fact disability has been further stigmatised as a result of advancements in technologies, such as genetics and human reproduction. Advancements such as these have only further alienated the whole or integrated person from the medically or scientifically, diagnosed person, the disabled.

Today it can be argued that the emergence of a new model of disability the genetic variant is little more than a revamped medical model. Which could actually expand the population of people with disability to include people whose impairments include defective genes. These disabled people with defective genes, may lead to a response of avoidance, discrimination or even elimination.

The rights based discourse fails to meet and address these challenges, as it is not designed to dismantle the concept of disability, but merely relies on constructed social perimeters to support its claims for rights and entitlements.

It is argued that society needs to look beyond a constructed view of disability to one of universalism. The Canadian writer, Bickenback (1993), best illustrates this view. He states that "disability is actually a fluid and continuous condition which has no
boundaries but which is in-fact, the essence of the human condition. And is a
c-condition which is experienced by us all, at some stage in our lives, disability is
actually the norm” (Bickenbach, 1993).

2.4 Definition of Terms – Normality

The term ‘normal’ historically refers to the standard, conformist, the usual and free
from disorder (Fowler and Fowler, 1984). A definition that is still in force today
impacting on the socio-cultural identity of the late 20th century and new 21st century.
Although ironically the 20th century was most notable for the celebration of difference
between peoples.

As discussed previously, the definition of disability historically has been defined by
theoretical models of the time, whether medically or religiously based. However,
the use of the term normality seems to be rare, with disability affecting one-fifth of all
Americans (U.S. Department of Commerce, 1997). Yet the definition by which the
U.S. base their findings, is applicable to all members of society not just those who are
publicly labelled as disabled. For in the U.S the definition it seems is based largely on
political correctness rather than the lack of personal facility.

"A person is considered to have a disability if he or she has difficulty
performing certain functions (seeing, hearing, talking, walking, climbing stairs
and lifting and carrying), or has difficulty performing activities of daily living,
or has difficulty with certain social roles (doing school work for children,
working at a job and around the house for adults) (U.S. Department of Commerce, 1997).

Disability is further segregated and defined with the use of the term severely disabled, meaning.

“A person who is unable to perform one or more activities, or who uses an assistive device to get around, or who needs assistance from another person to perform basic activities (U.S. Department of Commerce, 1997).

These terms suggest that normality is an illusion, a means of hierarchical classification, typically thought of as the human norm or ‘normal’, as led by medical ideology. The reasons for the futile search for an unjustified social perception are very complex, consisting of a plethora of variables specifically relating to personal reactions and insights. It is impossible, however, to illustrate and examine such variables as each person will have experienced and reacted to a situation in a unique way, thus colouring their emotions and thoughts.

The purpose of this research is to briefly examine some of the most commonly recorded reactions towards the search for perceived normality.

Although there are various different definitions for the term disabled, it has been decided that the above statement from the U.S Department of Commerce has been adopted for this thesis, as it clearly identifies the broadly accepted criteria by which a person is clearly classified as disabled.
2.5 What Factors Contribute to a Disabled Person Living a 'Normal' Life

The criteria by which a person is classified as normal is subjective. It is an observation that disability and the criteria by which one becomes classified as disabled has been taken to extremes. For example the U.S. definition of severe disability could include a short person as being disabled if they had to use a step ladder as an assistive device in order to reach an object on a shelf, during the course of their job.

Such definitions only go to provide society with the tools by which to categorise human capability and potential worth. It has been argued that we are all disabled during some time in our lives, in one way or another, a theory supported by the Canadian philosopher Bickenbach (Bickenbach, 1993) as well as the Indian philosopher Sarkar, who argues that “bodily difference should not be allowed to mask our essential humanity” (Sarkar, 1990).

So why is it that the disabled population in general strive to achieve what is a preconception? Being a disabled person to many is oppressive. But it is not the experience of being disabled that leads to this, but rather the “handicapping” effects of living in a society that is designed and controlled by the “Able-bodied”.

Living in a society of mostly able-bodied persons, individuals who have disabilities must contend with comparing the appearance of their bodies and functional capabilities to those of others around them. Mental health practitioners often see
physical deviation from the norm as central to people's behaviour and personality (Breakey, 1997).

The desire to achieve the preconceived norm it can be argued, is the result of several factors, including the needs to attain psychological and the physical comparison, but are these needs internally generated, or are they as a result of exterior pressures? Indeed does our environment and its impact, on freedom of choice and movement create them. Moreover these factors are now discussed in section 2.5.1.

2.5.1 Internal Issues

Issues generated internally arise from questions of body image. Cash (1991) states that “Physiologists use the term body image to refer to the attitudes we have about our own body and its appearance”. Body image refers to an individual’s perceptions, feeling, thoughts, and reactions towards their own appearance. With any alteration or abnormality from the perceived norm, an individuals body image generates a series of emotional, psychological or perception related imbalances.

According to Newell (1991), “less conventionally attractive people will likely receive less reinforcement from others, resulting in a decrease in self-esteem and a decrease in self-image”. Goldberg (1994) suggests that, even when a person’s disability does not affect their ability do to their job or take part in social, recreational activities, self esteem can still be affected.
It is only natural that the disabled person will compare their appearance and functional capabilities to others around them, and since the majority of the population are classified as normal it is likely that a positive attitude towards their disability will be hard to achieve.

Fishman (1959) states that “a person must learn to live with his perceptions of his disability rather than with his disability”. He goes on to say “the amputee tends to focus his or her anxieties on their altered or differing anatomy and give the disability more importance in his or her future than is realistic. Successful adjustment for the amputee appears to be in the incorporation of the prosthesis into his or her body image and his or her focus on the future and not on the loss/absence.”

The psychological issues resulting from limb absence or loss have further less obvious implications on the person’s self esteem and behaviour. Fishman (1959) goes on to identify seven human needs common to amputees:

- Physical function with a prosthesis.
- Visual and auditory considerations for the prosthesis.
- Comfort of the prosthesis.
- Energy expenditure in using the prosthesis.
- Achievement in various activities with use of a prosthesis.
- Economic security.
- Status and respect of one’s peers.
Controversially, he affirms these needs cannot be completely satisfied and the consequences of the frustration that arises can result in psychological conflict and varying behaviour. A theory supported by Goffman (1963) in similar research goes on to suggest that some amputees experience psychic pain which manifests itself in the form of a self enforced, self induced stigma. This leads to the amputee expecting to be ostracised from the group and feeling themselves to be less worthy.

A similar fear of rejection can be experienced by both new amputees and those with congenital absence from birth. This rejection fear can lead to an inner view of themselves being repulsive, which can be projected onto the world around them, resulting in the withdrawal so as to avoid pain, anxiety and the anticipated rejection.

The physical discrepancy in body image when compared to a perceived normal person can continue the anxiety and tension well into the amputee’s life, increasing in intensity over time unless addressed. These issues can only be rectified when the amputee is satisfied with their outward physicality and body image. Although an amputee’s needs cannot be fully satisfied in relation to their disability, the slightest deviation from the belief system can be detrimental to their quality of life. This in turn is a variable, which can only be measured by the amputees themselves.

It is easy to establish, even from this brief discussion, that the amputees understanding of how they are perceived by the world around them is rather negative. With the relationship between self esteem and body image issues impacting further on their everyday expectance of life, it is easy to appreciate how the outward appreciation of themselves, in conjunction with wearing a prosthetic limb can create conflict.
A person without a limb must see himself or herself as a person primarily and not be burdened by the establishment’s necessity for pigeonholing. It is crucial that the patient/user of prosthetics see themselves as an individual first and an amputee/disabled person second if at all (Kohl, 1984). Kole suggests that attitude is the driving force behind any positive adjustment following the involuntary gain of a new body image. In addition Shontz (1974) suggests that a person who is missing a limb, in the case of an amputee, has three identifiable body images, the intact pre-amputation, the body with limb loss and the body while wearing the substitute prosthetic.

Again, according Kolb and Brodie (1982) the healthy amputee is the one who accepts their loss, adjusting to the prosthetic and wearing it to assist the return to society such as work and resumption of their position in the family. Occasionally it has been noted that unusual personality traits can arise, resulting in problems of rehabilitation at work and creating family pressures. This can be due largely to the insecurity felt by amputees concerning their change in body image and how they perceive others look at their new circumstance.

2.5.2 External Issues

Externally generated issues as perceived by the disabled person are a direct result of the impact of their surroundings on their disability. In other words the effect of the designed/built environment, factors beyond the control of the disabled person, which may impair the disabled person beyond their physical limitations.
Therefore in using Fishman’s fifth factor (1959), “achievement in various activities with the use of a prosthesis” it is fair to state that the attainment of normality by means of the prosthesis is unachievable. Primarily as a result of the environmental factors resulting in increased feelings of segregation, a statement that can be supported by Beatrice Wright, in her publication “Physical disability a psychological approach” (Wright, 1960). She states that disability is “a condition of impairment having an objective aspect that can usually be described by a physician”.

Handicapped, another term within the same remit, but with greater emphases on the environmental is “the cumulative result of the obstacles which disability interposes between the individual and his maximum functional level”.

Therefore, it is fair to suggest that unless the very environment in which we live is designed with an awareness of individuals who may fall outside the predicted norm of two legs, two arms, fully sighted and unimpaired hearing, then the inclusion of all members in society unachievable. The requirements of integration within education, employment and society at large as expressed by the disabled, need to be addressed to avoid fuelling issues of inadequacy and abnormality, eroding the concept of normality.

2.5.3 Gender

One such issue is gender, which to all is a core factor, which goes to create the essence of self. People with disabilities are often denied their gender due to the fact that they are commonly restricted in their interaction with members of society both
able bodied and or disabled. Therefore the disabled are customarily denied or restricted in the opportunities to develop the necessary personal tools, which are important in the attainment and fulfilment of natural roles (mother, father, wife or lover). As a result, gender becomes less of an importance than disability, with the person describing themselves as a disabled male/female rather than male/female with a disability. It can be said that the disabled person is often thought of as non-sexed, as a result of societal reaction primarily identifying the disability over the gender or the person.

This heightened importance of their disability can overshadow pertinent issues, which affect their gender. For instance a disabled woman may overlook or deny issues of importance to able-bodied women, such as health, domestic violence, sexuality or feminism.

Concentrating on an individual’s disability can be detrimental, increasing vulnerability, as it is widely not accepted that the needs of the disabled are the same as the able bodied. Lacking vital information normally obtained during their younger relationship building years, the disabled can be unaware of their sexual rights as members of society, a theory supported by Swift, (1998). The basis of this being the physically limiting effects of the disability, and the often long periods of hospitalisation, weakness and treatment all impacting on an individuals psychological build.
2.5.3.1 The Female

The issues affecting the disabled male and female are distinctly different. However this is hampered through the lack of research conducted on the area of female disability, of any sort let alone limb deficiency. In addition the illustration of disability through the media is primarily expressed through the disabled male, further ostracising the female individual (Odette, 1984).

The female disabled person has several uniquely identifiable physiological and physical identifiers compared to that of the male. Historically in the western world women are socially identified by the aesthetics of their body. With the 21st century being responsible for the image of thinness being attributed to health, success and ability. Women are taught from an early age to be concerned with body shape, size, weight and overall appearance, with women that fall outside the unrealistic attainment of the perceived norm having experiences and attributes both mentally and physically different from other women in the same culture. This again results in feelings of isolation.

The further that the disabled person sees themselves from the perceived norm the greater their self esteem can be departmentally affected. This is heightened in the female, due in part, to the influence of the media dictation of what is desirable, and what is or is not a woman (Nead, 1993).

Both male and female alike, form images of themselves from an early age, with these confirmed and altered by the responses or evaluations of others. Based on physical
judgements the disabled are continuously bombarded by messages from friends, family and society at large, about their perceived inability to participate in the roles usually expected of their gender. Society believes that the lack of physical attractiveness or just the mere fact that they are physically different from the dominant cultural norms hampers their ability in many areas including intimacy. These incorrect perceptions hamper the ability to see beyond ones disability perpetuating body image dissatisfaction.

Within our culture having a disability is viewed negatively. As stated earlier the disabled are seldom referred to in the media, with the only exemption being distorted into romanticism, dependency, anger or super human feats. This is substantiated by the Canadian Centre on Disability Studies (Enns, 1982), who state “what a non-handicapped person does as a matter of course, what he is generally expected to do often becomes noteworthy or extraordinary when done by a disabled person”. He goes on to question “Is it not because so little is expected of the physically handicapped? ” This viewpoint again perpetuates the feelings of isolation and otherness.

The experience of the disabled female indicates that the lack or diminishment of expectations of the societal female role is based on the wider cultural perception of desirability, held within the identified norm. Primarily affecting the young disabled female, biased cultural opinions and messages once internalised and reinforced by experience often become triggers for the deep seated need to be accepted at all societal levels. This results in the disabled person resorting to extremes, hiding or dramatically changing their appearance, oblivious to comfort or health issues. Much
in the same way as non-disabled females address and strive toward socially generated norms (Pollock, 1998).

Much feminist theory has only identified the female body as being objectified within the context of normality, often failing to identify factors specifically relating to the disabled female. The objectification the non-disabled female through the media is somewhat different to the objectification issues experienced by the disabled female, who is often objectified as a result of the medical professions lack of understanding in relation to female disability issues (Odette, 1984). Often the disabled female is monitored by groups of medical professionals in the name of treatment determining the best course of action, assessing dexterity and flexibility with little attention being paid to the affects of prolonged intrusive nature medical investigation (Odette, 1984).

Furthermore, the surgery, treatment and prosthetics that many disabled people endure can increase the prevalence of psychological issues connected with the attainment of the perceived norm. This is especially true in respect of the female, who will often be more recognisable to the general public as a lower limb amputee due their wearing feminine fashions such as the skirt. It is hoped by many, that treatment in any form will result in ‘cure’ or a redress of the disability, so as to attain social acceptability. However the pursuit of these norms often results in further discomfort as a result of body change through amputation or what is commonly referred to as “breaking in” of the prosthetic. Both exercises can be extremely painful, resulting in scars, diminished sensation and in some cases the phenomenon called phantom limb pain, to which there is no acknowledged treatment. It is often the case that the disabled person does
not realise the consequences of such treatments, often building resentment towards the rehabilitation process aimed at redressing their disability.

For many disabled women a common theme emerges following such treatments feeling that their bodies are not acceptable or desirable. To be non-disabled is the "ideal" coupled with which are the additional expectations for the quest of the "perfect body".

Body image and self-esteem are affected through the treatment, investigation, and resultant disability redress however it must be understood that the disabled woman is affected in a greater sense as a result of the perceptions held by society, family and indeed friends. Disability is often seen as a "deficit" and to many acceptability socially is a means of attaining the "ideal". However it is only when the disabled person sees herself as a woman that society at large can identify her as "female" (Brown, 1992).

"we must also embrace ourselves as we are, - with our disabilities, with our varied needs, with our diverse strengths and weaknesses. To embrace ourselves as we know ourselves – with our disabilities, but to celebrate them. To sing clearly and out loud our praise, our struggles, our failures, and our success: our lives." (Brown, 1992).
2.5.3.2 The Male

The issues affecting the male disabled person are in some areas a parallel to the female, such as issues of body image and self esteem, however, the major result from societies historic interpretation and ill-founded perceptions. As mentioned in section 2.5.3, with some notable exceptions, the primary illustration of disability impressed on today’s society is largely based on the male gender, thus affecting the males self esteem and confidence should they not live up to these images.

The public is often bombarded by images of disabled heroism and bravery, as in the images of the para-Olympics, which seemingly concentrate on the disability rather than the athletic accomplishment. This idealisation of disability created in the media detracts from the true heroic nature of the disabled persons struggle. Concentrating on the extraordinary rather than on the every day.

This media interpretation only demonstrates the superhuman, thus negatively affecting the psyche of the disabled male person. As it is felt by many, that only through superhuman acts and feats that the male disabled will be socially accepted and become an actively contributing member of society. This is a view supported by Steven E Brown who discovered that almost all disabled people have performed an act of heroism largely due to their experiences connected with widespread discrimination (Brown, 1992). However when bombarded by images of male one legged and wheelchair bound athletes, it is exceptionally difficult to see that ones personal day to day living may be extraordinary.
The feelings derived from images such as these are often built on the same historic social reactions to disability. Parallels are being drawn to studies based in Mexico conducted by Rizera in 1983 and cited by Smart and Smart, (1991) who state that within the Hispanic community, men had been taught from an early age that they were responsible to provide all of the resources for their family and that the women were to occupy the role of home-maker. Hispanic men with a disability hence often believe that their lives were devastated if they found themselves unable to fulfill this role as family provider because of disability. This is also true of western society at large. Which although more liberated in its views concerning feminism and the role of the house maker, still largely retains the historic concept of the male hunter gatherer and the family home based female.

This statement can be supported by one of the most recent poles concerning participation and attitudes to and from disabled peoples. The Harris Survey conducted in the United States, found that in terms of employment, two out of three adults with disabilities indicated that their disability prevented (41%) or made it more difficult for them (26%) to obtain their preferred job (Harris, 1998).

The effects of self-esteem following disablement or congenital disability can also have implications impacting on the sexuality of the male. Again historically based, procreation has one primary fundamental rule, that of attraction. Attraction is primarily based on the physical attractiveness of the gender and generally connected with health. Therefore our definition of health by its very nature is based on the establishment of ability. Hence, should an individual's ability be impaired they are less likely to attract a member of the opposite sex, therefore limiting the ability to
procreate. A claim substantiated by another Harris poll (Harris, 2000), in which it was found that 46% of disabled people compared with 23% able bodied people felt more isolated from other people in the community.

Again with issues of sexuality the male can struggle following traumatic bodily change. The male psyche as previously stated is based on the hunter-gatherer, which although primitive is guided by the ego. As a result, the disabled person may become anxious, embarrassed, or even ashamed of their own bodies, which may affect a persons desire or satisfaction with interaction with the opposite sex. This can be due to several factors most notably, perceived movement limitations or the thought that the opposite sex will not understand and be repulsed by bodily difference (Lukan, 2000).

2.5.3.3 Impact on Children

One of the lesser recognized effects of physical disability are the factors that may limit the interaction between parent and child. Instances are often stated within a disabled person’s personal statements that one of the most emotional and esteem damaging factors with amputation is connected with the family. Particularly focusing on play, picking up a child and or general physical interaction. The perceived inability or reluctance to interact through an unfounded fear of hurting the child are often precursors to feelings of inability, uselessness and even rejection focused upon the child.
Although just a fragment of the myriad of feelings that may be experienced by each disabled individual. The statements encapsulates an approach needed in order to become truly happy with our difference through disability not only in the physical sense.

“we must also embrace ourselves as we are, - with our disabilities, with our varied needs, with our diverse strengths and weaknesses. “To embrace ourselves as we know ourselves – with our disabilities, but to celebrate them. To sing clearly and out loud our praise, our struggles, our failures, and our success: our lives.” (Brown, 1992).

2.5.4 Environment

In the last ten to twenty years it has become increasingly recognized that it is not only the effects of a particular medically named and established disability that hamper a persons ability to interact on a social level. Increasingly it has been theorised that the environment in which we all live has a greater impact on our lives than first thought. With an increased awareness that disabled people have to confront design issues, especially access within the built environment (Barnes, 1991; Imrie and Wells, 1992). As a result it has been recognized that the segregation once thought of as being defunct in the form of institutionalisation is now becoming legitimate through poor designed, and planning of our modern cities and environments at large.

It has been suggested by Hahn (1996) that it is not only the obviously disabled that are feeling the effects of the lack of planning and design consideration. Indeed he
suggests that most environments are designed with only the physical ideal in mind a state that few can aspire to.

It has even been suggested that these ideals in physical state are not only a result of limited observational thinking but are largely due to our adoration of esteemed past members of the architectural fraternity, such as Le Corbusier who suggested that “Man must be rediscovered” (Gardiner, 1974). However, what he negated to mention was the very existence of the female let alone any other bodily differences. Indeed this is a mistake that even Henri Dryfuss made although he acknowledged the female form.

Surely today with our vast experience and understanding of the human body and our apparent understanding of its diversity we should design for all. However this is definitely not the case even every day artefacts, which the able bodied take for granted are usually quite literally out of reach, unavailable or require a level of dexterity above that possessed by most disabled people.

Examples of such instances in our everyday lives exist everywhere, impacting adversely on mobility interaction and quality of life. For example even the mundane activity of posting a letter, to a wheelchair user is an ordeal while retail clothes distributors rarely have changing rooms suitable for a wheelchair or containing even a chair which to many disabled people is a necessity when changing.

It is a paradox that the very people best qualified to talk about such issues, the disabled, are often unheard as the very obstacles that they are campaigning about,
restrict and even deny their opinions, as they are unable to attend due to public transport and access.

Only when the attitudinal and architectural barriers are eliminated will people with a disability be able to fully interact in society. In addition it must be understood that the state of disablement is a continuously changing condition, regrettably experienced by us all at on time or another, whether from the perspective of physical, mental disability or the disabling effects of our environment.

2.5.5 The Ages of the Amputee

The commonalties of prosthetics fitment between children and adults are only concerned with the amputation and the resultant prosthetic being primarily the same with slight differences including size and in some cases, lifestyle design. However little research has been undertaken concerning the effects of age in relation to prosthetic use and the psychological effects of limb loss and the prosthetic replacement.

It has long been assumed that the feelings present in the child, adult and elderly are in parallel, each experiencing the same anxieties and dealing with them in a similar manner, however this is unlikely to be the case.
2.5.5.1 The Child Amputee

There is no doubt that children born with limb deficiencies have very different experiences than the child who loses their arm or leg. This is due to there being no change in bodily difference, understanding their physicality from birth, therefore they have not experienced any loss. This being said, the loss is often experienced by the family of the infant who experience anxieties built upon their awareness of the possible impact that it may have on the child’s future. A view supported by Richardson (1970) in which he suggests that prejudices towards the physically disabled were found to emerge early in childhood. Thus children with physical abnormalities must be prepared to handle teasing, questions, and comments from peers, in addition to allaying their own concerns about feeling different and unattractive. It is therefore crucial at this stage that the family has contact with the medical establishment and indeed the families of other disabled people through support groups. This approach will empower the family with the knowledge and experiences of others who might have gone through similar experiences.

This supporting contact is crucial so as to secure the fabric of the family and set aside fears and concerns, in turn give hope towards a favourable outcome. This can be well illustrated by the story of Liam Mellors a football mad teenager in the U.K who following being diagnosed with a cancerous growth in his lower leg had to have it amputated. Subsequently receiving a prosthesis and now with the help of his support group family and practitioners alike enjoys a full and varied life (Moore, 1997).
From the perspective of the rehabilitation of the upper body amputee there is no universal consensus regarding whether to fit the child with upper extremity prosthetics or what type or even an expected time in which to do so. But it is imperative again that the family be consulted and facilitated with all the necessary information to aid the decision making process. It is fortunate however, that should a decision at a later date prove to be wrong, it is easily corrected.

In the case of a child with a lower limb deficiency the options are less controversial, with prosthetic fitment generally being conducted as soon as the child is beginning to try and pull itself up and stand. However it has been suggested (Lilja and Oberg, 1997), that to limit the damaging effects of perceived bodily difference in conjunction with self esteem issues, that a fully functional and cosmetically correct limb be fitted as soon as possible. In addition the fitment of such a prosthetic at an early age is congenial to the social acceptance of the child and indeed the perceptions of its family. However in the UK preliminary prosthetics known as ‘Pylons’ are prescribed, these are basic and rudimentary consisting of socket, two supporting struts and a substituted foot in the form of circular base. Such limbs are strictly only to allow the infant to establish fundamentals such as balance and indeed the ability to stand upright, therefore their cosmetic similarity to a flesh limb is unnecessary.

In the event of the infant being born with both, upper and lower extremity defects or absences, it is commonly the practice to fit the lower limbs with prosthetics first. As it is perceived, more important to establish the child’s standing and walking ability over, upper limb concerns. With the upper limb being fitted at a later date, in some cases years after. This is due to the belief that the child has enough mental and physical
rehabilitation and adjustment to contend with in learning and coping with their lower prosthetics without the added potential burden of upper prostheses. Although in the case of all four limbs being affected, the normal procedure generally is to fit the child with the necessary prosthetics as soon as possible and follow up with physiotherapy and monitor the child’s psychological wellbeing.

Whatever the decision, it is most important to instil the child with a sense of self worth, allowing them to explore the world around them, growing and developing like a normal child.

The infant or very young child with an acquired amputation is often lies oblivious to the social bias associated with disability, although the surgical trauma or disability can be enormous. Therefore the older child who has experienced the discrimination often recognises the social intolerance imposed on themselves when they have unfortunately become disabled. In turn, the parents of such a child feel guilty and helpless especially if an accident was the cause.

In the event of illness or disease being the cause of the amputation, fear of death can become a real issue. This needs to be instantly addressed and dealt with in a professional manner, so as to reduce and nullify the very real fear created by the amputation. In addition should the amputation be caused by an illness such as meningitis, which can effect adversely or even in extreme cases, bring about the loss of all four limbs, issues concerning intense anger and depression can develop (McGurran, 1999).
It is imperative that in all cases, the child be made part of the decision process allowing the child power over their own condition, so as to nullify issues of helplessness. This can be done by involving the child in decisions such as the cosmetics of the prosthetics. Often the child has favourite colours or cartoon/comic heroes, which by way of transfers, can be used to skin the limb. This again can encourage the child to use the limb and feel more at ease with it and themselves, as the decoration can become more of a school yard talking point than the disability itself.

Fortunately however it must be said that children function and adjust to life more positively than an adult with the same condition, generally due to their enthusiasm, energy levels, mental and physical flexibility.

2.5.5.2 The Adolescent Amputee

The teenage years are turbulent for us all but even more so for the amputee. We all experience insecurities and neuroses, ranging from the hormonal to the peer, sooner than later growing out of them. However, for the teen amputee, these times are more demanding than most. As we have already seen issues concerning body image and difference impact on the lives of all amputees, but at this stage of life, the amputee is under irrepressible continuous bombardment, not only from their peers but more importantly from the media-generated world around them.

Adolescence is a time where we form opinions and preferences, which undergo rapid change, the child that has rejected their prosthetic may want a new one made or even
vice versa (Williams, 1997). Also at this time an increased interest in the aesthetic properties of the prosthetic can occur, requiring a more and more natural looking limb with, hair and vein decals.

Often it is difficult for the parent at this time to accept the adolescents contrary views. Especially should the teen user reject their prosthetic, but the self-esteem must be encouraged and their own identification of self-worth expressed at this time in the standard way, for instance, piercing, tattooing or any number of ways of expression. The decisions made at this time are generally a default reaction of rebellion, which tends to be just a phase, and is often short lived.

Again in these teen years it is expected that new interests will be born, often resulting in the desire to participate in sporting or other athletic pursuits. Again calling on the expertise of the limb fitter and the patience and support of the parent who often find themselves in the unenviable position of over-protecting their little boy/girl. It is easy for the parent at this time to forget their own experiences as a teen, especially since there may have been a great deal of rehabilitation in the child’s early years. However through consultation between the teen, limb fitter and the parents this anxiety can be dispelled. In such cases it is not unsurprising that the teen may require two or three pairs of limbs, one a general all purpose prosthetic and ones specialised for running or swimming. Which again can cause parental concerns due to the expense of these specialised limbs, which are generally not under the National Health within the UK and are outside insurance elsewhere. The challenge to the prosthettist and the patient at this time it to be tolerant of what the teen user needs, ever being vigilant to idiosyncratic and often erratic teenage demands.
In comparison to the energies and approach held by the teen user toward the challenges of being an amputee, the adult often perceives the whole experience as being a crisis, not just personally but reflecting on the family as a whole. The reactions of the adult can be varied depending on their personal situation with regards to lifestyle, income and psychological characteristics, although most feel guilty regardless of cause. Again as in the previous scenarios the support of others that have overcome and are successfully adjusting to life as an amputee can be invaluable in aiding the rehabilitation process.

It is imperative that the amputee from the very earliest stages be introduced to the possibilities of today’s modern prosthetics. As it is still a perception of many that today’s prosthetics have changed little since the peg legged, hook handed pirates of the late 16 century, dramatised in the form of Long John Silver, by Robert Louis Stevenson in his book *Treasure Island* first published in 1883, but this is of course not the case. It is for this reason that it suggested that a process of consultation be initiated, asking questions, researching possibilities and again meeting others in a similar situation.

Another concern of the new amputee is again the perceived inability to live a normal life, in terms of activity levels and returning to work. Again the prosthettist is key in the introduction to possible solutions, informing the amputee of the options and variations which would best suit the patient’s lifestyle and future ambitions. It is
imperative that feelings such as this are addressed at an early stage and the best possible solutions initiated, so as to reduce personal and social stresses. The results of a recent Harris pole, on community participation indicated that only 32% of disabled people of working age, that is between 18–64, had full or part time employment, compared to 81% of the non-disabled population (Harris, 2000).

From data such as these it is easy to see that the importance concerning the correct choice of prosthetic is crucial not only from the issues of self esteem, but from the standpoint of achieving comparable pre-amputation activity levels and comparisons made between ones self and ones peers. Therefore the choice of limb is primarily connected with vocational and recreational interests.

The amputee may require a more robust but rudimentary exoskeletal limb as their working life may demand its inherent strengths. Alternatively they may desire an endoskeletal prosthetic with a soft covering, usually this is determined by their activity levels and indeed financial ability in many instances.

Again the activity levels desired by the amputee are only delivered upon the comfort and practicality of the limb being achieved, this in turn can eradicate issues of self confidence and insecurity. It must be remembered that if the amputee looks good in the prosthetic then they will feel good and participate freely and fully in the community.

It can be argued that although the teen user amputee and the adult have very interesting and unique challenges to face, the senior amputee is often confronted with
specific difficulties. The frequency of adult amputees is greater, most necessitating an amputation due to diabetes and or vascular disease. Often the adult amputee is weak and frail following sometimes months of treatment culminating in the amputation. Feeling of uselessness is common, re-living their youth and comparing their current predicament with their past.

Also issues of death are prevalent, often prompting questions like “why me” or “what have I done to deserve this”. In addition thoughts run to how long will I live once they have received the prosthetic and what will life be like with one. All these questions and many more intrude the psychological state of the adult amputee, initialising a period of general physical, emotional and mental decline, adversely affecting both amputee and family. Therefore, again it is imperative to instil a feeling of hope and a positive outlook, so as to instil the benefits of amputation and the prosthetic such as the alleviation of months of pain, benefiting the patients psychological outlook.

Following amputation it is impossible to predict the frequency of prosthetic use in the older patient or whether they will be able to use one at all. Recent studies have shown as many as 75% of older leg amputees will use their prosthetics competently if rehabilitated, given adequate care and training (Williamson, 1995). Starting rehabilitation quickly prevents both mental and physical deterioration, combined with the early fitting and walking training has been proven to reduce the debilitating effects of prolonged inactivity, allay fears of immobility and dependency, improving both quality of life and self esteem (Williamson, 1995).
Subsequent choice of prosthetic is again connected with the amputee's previous activity levels. The golfer in his 70s may be best suited to a lightweight modern prosthetic alternatively a basic prosthetic with its easy suspension and stable joints might promote independence. The prosthetic should be tailored to the particular needs of the amputee, not reliant on the pre-diagnosed age related theories. The goal should be to increase both independence and prolong a high quality of life.

Although all ages experience similar issues connected with amputation and rehabilitation, its impact can vary depending on a multitude of factors. It is however interesting that there is a correlation between desired activity levels following amputation and the preceding activity levels. It seems that this factor is imperative in establishing self worth and self esteem, the ability to match one's peers and live up to one's own dreams and ambitions is pivotal.

2.6 Conclusion - The Public Reaction to Disability

Often the disabled person is ostracised within society, being considered as an invalid regardless of the severity of their disability. It is true to say that the general public at large appears to be ill educated as to the needs or even how to converse with a person who has a disability. It can be surmised that this is as a result of their limited presence within the community, it is only too understandable that ignorance although primarily unintentional is predominant. This ignorance manifests its self in many ways drawing parallels with race discrimination (Enns, 1982).
However, it is difficult to quantify the degree of ignorance and discrimination due to the presence of "paranoia" within the disabled community. It has been suggested that (James, 1997), this paranoia is due to the concerns regarding body image held by many disabled people, connecting irrationally with self perceived stigmas, i.e. I feel you dislike me because of the way I look or have to do things.

Richardson (1970) suggested that the prejudice towards cosmetic differences emerge early in childhood. He found that as the non-handicapped child grew older, they ranked photographs of children with cosmetic handicaps such as (left hand missing, facial disfigurements), as less liked than children with functional handicaps (needing leg braces, crutches or a wheelchair). This compared with children with no physical handicaps who were most liked, means that from an early age we are segregating our society based on a irrational preconceptions, historically antiquated standpoints or unsuitable education both parentally or scholastically.

The observations of Richardson (1970) are confirmed by resent research conducted by the Leonard Cheshire charity into social exclusion and their hopes for an inclusive future, entitled "Committed to Inclusion". It states that although the Government has undertaken a campaign designed to increase the general public’s awareness of disability issues and the establishment of the disability rights commission, there has been little change in positive attitudes (Leonard Cheshire Charity, 2000).

The study identifies that society must establish a familiarity with disability so as to erode preconceptions and promote talents and abilities within the disabled community. This in turn will diminish the fatalistic view that disability inevitably
leads to exclusion. This research focused on two main areas of importance to the disabled person, those of transport and employment (Leonard Cheshire Charity, 2000).

The research found that the general public is quite aware of the needs of the disabled, with respect to employment. In addition the Leonard Cheshire charity positively stated that 79% strongly supported the right of disabled people to have mainstream education wherever possible and 100% agreed that disabled people should have the same working opportunities as non disabled people. Two thirds of respondents indicated that they worked for organisations that have a policy of active assistance for disabled people.

The Leonard Cheshire study, however, illustrated that there is a lot to be done before disabled people are in ‘decision making’ positions, as well as demonstrating that only one fifth of respondents indicated that there was no attitudinal barriers to full equality of opportunity. In addition it was stated that 75% of people felt that disabled people do not have equal rights in this country, despite the positive attitudes it was also found that people have a reservation about total inclusion on a practical level, which will need careful management (Leonard Cheshire Charity, 2000).

Similarly research undertaken in the United States shows how pervasively the disabled are disadvantaged in general and how far they have to go before their quality of life even approaches that of people without disabilities (Taylor, 1998). Again the issues that were found to be the biggest differences between Americans with and
without disabilities were employment, income, transport, health care and life satisfaction, this can be used in direct comparison to the Leonard Cheshire survey.

Although the study found that participation amongst the disabled and non-disabled were at similar rates in given community activities, and that desire was comparable, disability was not the prohibitive factor in restricting the disabled from community participation. This was largely due to perceived issues of unacceptability on behalf of the disabled person. This reflects on the historic references such as “The Beggars” or “The Cripples” by Pieter Buregel, (DeMertino, 2000) which describes the somewhat recent manner in which the disabled were institutionalised still has repercussions on today’s society. Both from the general public sense and the psyche of the disabled person.

As mentioned in section 2.5.1, the disabled person sometimes has issues of insecurity resulting from a diminished self-esteem due to body difference. This affects the ability and desire to interact socially and as a result the disabled person sometimes feels inadequate when in social surroundings. This is not to say that the experiences sometimes encountered are paranoid delusions, but the feelings of insecurity are sometimes exaggerated or misinterpreted. The caring approach of some people toward the disabled can be displayed in ways that may seem patronising or ridiculing, when the desired affect was to demonstrate appreciation or just innocently help.

In comparison it is sometimes through direct ignorance that the disabled are restricted from participating in every day activities such as education or work. Some non-disabled people can feel that the disabled person is unable to work, participate or even
take care of themselves and as a result the give no respect, trust or responsibility. This may adversely affect the disabled person, further diminishing their sense of self worth.

Alternatively, some non-disabled people make excuses for the actions and reactions of the disabled feeling that they must have conducted themselves in a negative manner as a result of their disability, thus excusing unacceptable behaviour, almost condoning their actions.

2.6.1 Disabled and the Law

The condoning of actions towards disability is prevalent in the judicial system of many countries that are often referred to as forward thinking and progressive such as the United States in their attempts towards inclusion. It is argued that inclusion should be the same for all, particularly in the way we all abide by the laws of the land.

However this appears not to be the case. It was recently reported in the United States that a woman Deborah Lynn Quinn following sentencing for the possession of banned substances was kicked out of jail, not even being pardoned. The reason being that it was too expensive to keep her. It can be argued that Quinn having no arms, no left leg and only half the right leg was no threat to society, but this did not prevent them committing the crime in the first place. This is not an isolated occurrence repeatedly it seems that the judicial services are becoming incapable of enforcing the law when prosecuting a disabled person the world over (Phillips, 2000).
2.6.2 Disabled and the Hero

Alternatively the disabled person can often be revered or made a heroic figure. This again may be innocent on the behalf of the non-disabled person, who genuinely feels a great deal of respect, for their determination and ability. However the disabled person, who just sees their life as nothing out of the ordinary, may misinterpret this.

So as we can see the reactions of the non-disabled person coupled with the likely insecurity of the disabled person can prove to undermine their confidence further, although generally it is as a result of erroneous preconceptions.
CHAPTER 3

AN ASSESSMENT OF THE EFFECTS OF AMPUTATION ON THE DISABLED PERSON

3.1 Amputation Level and its Effect on Prosthetic Use

The disabled person’s use of their prosthetic following amputation is crucial to their development and rehabilitation both physically and mentally. Many factors are influenced by this which at first appear to be of moderate importance.

Prosthetic use is probably one of the most frequently discussed issues within the professional literature and there is a view that amputees with Transtibial (TT) amputations have better functional outcomes than Transfemoral (TF) amputees. Gauthier-Gagon et al (1998) suggested that this was due to the fact that physiologic energy expenditure of walking increased dramatically with the level of amputation. In addition it is suggested that amputees with upper limb absence or loss suffer from increased problems of stability, functionality and independence, all of which further impact on the amputees psychological build, and energy expenditure.

In addition the prevalence of amputation is higher in the older age groups, 50 plus, where concomitant conditions such as cardiac and respiratory problems are more common, again impacting on the their prosthetic use. Similarly, Sirwardena and Bertrant (1991) demonstrated that persons with lower extremity amputations who have ischemic heart disease and chronic obstructive pulmonary disease such as
bronchitis, do not perform as well as healthy amputees in their ability to walk. Normal walking requires little energy, but following amputation of a lower limb, muscular activity needs to be modified to enable walking with the prosthetic, this correspondingly expends increased levels of energy.

Energy production depends on the oxygen delivery capacity of the cardiovascular and pulmonary systems and this become less efficient with age. The elderly amputee with vascular insufficiencies or amputee with other limb deficiencies must accommodate these impairments, and the requirements for walking may impose excessive demands on the cardiovascular and pulmonary systems. In such cases where these systems are deficient, the physiological stress may be overwhelming and deter movement with the prosthetic (Astrand, 1973).

In parallel the leading cause of lower limb amputation is peripheral arterial disease, with or with out diabetes mellitus, being a systemic disorder which over time may affect the remaining limb or stump and other organs. Many amputees in the latter stages of life or suffering from this condition complain of varying problems, from poor circulation in the remaining limb, claudication pain (muscle cramp when walking), and overall pain including sores, all of which were found to hamper use of the prosthetic limb, both indoors and outdoors.

In addition it has been found by Sussak (1980) that the stump was not the cause of limited mobility but rather the unaffected limb as a result of blood flow issues and problems. Furthermore Sussak observed that the vascular status of the transfemoral group was generally worse than that of the transtibial group, arguing that in the event
of an above knee amputation the damage through disease would have already affected
the other limb (Sussak, 1980).

3.2 Rehabilitation and its Impact on Mobility

It has been long suggested that delay between amputation and prosthetic limb fitting
and walking may result in prolonged inactivity and consequently in cardiovascular de­
conditioning and loss of the metabolic reserves required for walking (Pohjolainen,
1989). This is particularly important in the treatment of the elderly whose mobility
and physical reserves may already be reduced due to the physical bodily demands of
treatment trauma and increased activity within the immune system.

In 1972 Hamilton and Nicholas stated that “any period longer than four weeks
postoperatively” was considered as “undue delay for fitting the geriatric lower limb
amputee” (Hamilton and Nicholas, 1972) this was later supported by Collin (1992)
and Gauthier-Gagon et al (1998). The effects of such inactivity can be likened to the
period of time following the removal of a cast from a limb. In such cases the limb
begins to wither due to lack of use causing the muscle to diminish and contract. As a
result even the relatively short period of time that it takes to heal a broken bone can
lead to the rehabilitation treatment taking extended periods of time until full use and
strength is regained.

This prolonged delay between amputation and prosthetic fitting and walking is
negatively associated with prosthetic wear both indoors and outdoors, with the delay
being significantly longer for those who do not persevere with their prosthetic.
However, the duration of the actual rehabilitation does not necessarily correlate with
the success of the programme and therefore may not positively increase the use of the
prosthetic. Furthermore the rehabilitation process may actually negatively affect the
wound healing process and may increase or even bring about other chronic health
problems. This specifically applies to amputees who are more prone to cardiac,
respiratory, and neurological problems, as well as constant stump pain and vascular
and arthritic problems in the non-amputated limb (Gauthier-Gagon et al, 1998).

3.3 Prosthetic Acceptance

Acceptance by society in the form of friends, family and peers is extremely important
in the rehabilitation process following amputation and is pivotal in the amputees
adoption of the prosthetic (Green, 1980). People who eventually accept the loss of a
limb endeavour to increase functionality with the prosthetic, this is variable due to
personal adjustment (Friedman, 1978) reflecting personality and the degree of
integration of the prosthetic into their self perceived body image and how well they
feel it has replaced their lost limb.

Friedman’s (1978) study identified that personality profile is an important factor in
acceptance, people with a strong self image are generally self assured, confident and
have a more stable motivation. In contrast it has been observed by Gauthier-Gagon et
al (1998), that amputees with a poor perception of self image and therefore limited
motivation were more likely to discard the prosthetic following the completion of the
rehabilitation program.
In addition acceptance and the connected motivational aspects of rehabilitation have been found to adversely affect the time between amputation and limb provision, sometimes resulting in long delays. Although this delay is associated with several factors including, the wound healing process, dermatological issues and muscle training, it seems that non-users following such delays are more likely to consider themselves ill adapted to the prosthesis, a feeling that is compacted by prolonged and intensified pre-prosthetic training and physiotherapy. Furthermore limited initial mobility following amputation and trauma increases the amputee's degree of social discomfort and is often a precursor to symptoms of depression. Further restriction of normal activities seems to play a key role in producing symptoms of depression even when combated by the beneficial aspects of social contact, increased prosthetic use, and adequate household income. Therefore it is foreseen that should one of these factors fall below personally accepted levels that the result may be a restriction of routine activities which will again impact on acceptance, increasing the chances of some degree of patient depression (Williamson, 1995).

The ability to carry out normal activities, therefore, is critical to the psychological well-being of mobility compromised people, and it is imperative to limit the duration between initial limb loss and prosthetic fitment.

Indeed it has been identified that those who wear their prosthetics for longer periods of time are less depressed and that there is a negative correlation between time since amputation and depression, which can only suggest that the effects of limb loss dissipate over time therefore reduce likelihood of depression (Nicholas, 1993). This it is felt is due to two main factors. Firstly the physical healing time and secondly the
mental psychological healing period in which a realization is gained allowing the amputee to understand that given a little extra effort a close facsimile of their life prior to amputation can be achieved. Again this is facilitated and aided by contact with people in a similar situation, medical rehabilitation and family/friends social support.

3.4 Predictors of Prosthetic Use – Symptomatic

As discussed earlier a person with cardio respiratory dysfunction or further limiting disability/illness will have greater energy expenditure over an otherwise healthy amputee. Hence motivation to walk and attain a reasonable standard of mobility and quality of life must be high, in order to overcome these further restrictions.

Furthermore other studies such as Gauthier-Gagon et al, (1998) also confirm that the adaptation to prosthetics when combined with level of amputation and respiratory tract disorders, or the duration of prosthetic training are predictive of prosthetic wear and active use.

Gauthier-Gagon et al, (1989) further identified that given the previously mentioned predisposing conditions that a Transtibial amputee was found to wear their prosthetic for 53 hours per week in comparison to an amputee who was otherwise healthy who would wear the prosthetic for 85 hours a week or alternatively 12 hours per day per week. This again can be argued is due to the further effort expended and energy consumed in order to function with both a primary amputation and a secondary condition.
Again in this study it was confirmed that the duration of pre-prosthetic training was in correlation with the probability of ambulatory activities indoors. That is reduced rehabilitation times increases the amputee use and duration of use of their prostheses. It could be assumed at this time that the rehabilitation process may be better conducted in smaller less intensive periods so as to limit the psychological shock of what is essentially learning to walk again. In addition the rehabilitation process should further take into account the change in body image and how this may affect not only the physical effort of learning to walk but the psychological effort of coming terms with what has happened to their physicality and mobility.

3.5 Predictors of Prosthetic Use – Patient Profile

Factors other than energy expenditure and speed of rehabilitation must also be considered as variables and predictors pertaining to prosthetic use. Other obvious factors are the age of the amputee, mental state, self related health and stump pain or discomfort. Less obvious factors such as the home living conditions, living arrangements, claudication pain, and time lag between amputation and prosthetic fitment, must be considered.

Further stated by Gauthier-Gagon et al, (1998), “an individual who lives at home, has no claudication pain in the non-amputated leg, has been fitted within 135 day after amputation, and took 55 days to complete walking training would have a 65%, chance of using his prosthesis for the majority of his ambulatory activities indoors, but the probability would drop to 38%, if that person had claudication pain and a longer
prosthetic fitting after amputation, for example 185 days”. These data would seemingly suggest that the increased energy expenditure of the amputee due to secondary complications is the guiding factor behind their acceptance and use of the prosthetic.

In addition, however, the increased time between amputation and fitting may suggest that there may have been other complications following amputation adversely affecting the rehabilitation and training period. Therefore attention must be paid towards the suitability of the amputee to undergo further traumatic procedures, it is important to establish a time at which the body and mind has healed sufficiently enough to undergo the rigours and unfamiliarity’s of prosthetic fitment and training.

3.6 The Need for Prosthetics Development – Historical Reference

General issues of disability are concerned with lack and inferiority resulting in inability to pursue a full and active life. It is therefore fair to argue that this inability and lack must be corrected by addressing the core problems, which have historically reoccurred.

3.6.1 Introduction

The historical development of prosthetics and amputation surgery begins early in the history of human medical practice. Its historical twists and turns parallel the development of medical science, culture, and civilisation. Prosthetic history begins with the spiritual and functional need for wholeness. Prostheses were developed for
function, cosmetic appearance, and a psycho-spiritual sense of wholeness. These patient needs exist from the onset of civilised society to the present. Early prosthetic principles that were developed exist to this day and are amazingly efficient in function. In the three great civilisations of Egypt, Greece, and Rome the first true rehabilitation aids recognized as prostheses were made. The Dark Ages produced prostheses for battle and hiding deformity. The Renaissance emerged and revitalized scientific development begun by the ancients. Subsequent refinements in medicine, surgery, and prosthetic science greatly improved amputation surgery and the function of prosthesis. The industrial revolution brought about prosthetic advancement fuelled by money available to amputees following the American Civil War; painting a colourful array of humanitarians, scientists, and charlatans. Finally the modern era of prosthetics arose with quantum leaps in technology developed in two world wars. With fundamentally proven prosthetic principles never outdated, only the methods to accomplish them refined. Ideas are endlessly being recycled from the past. Concepts that may have been impractical at the time of their inception become possible with developments in materials and technology. Prosthetic science advanced in leaps and bounds when a forum for research and discussion are created with a common goal in mind.

3.6.2 Prehistory – Mankind’s Awakening

The earliest evidence of human recognition of deformity and concern for rehabilitation is difficult to determine. Many ancient civilisations had no written records and history was recorded orally in poems, sagas, and songs. With much
evidence only discovered through anthropology and to the interpretation of artwork, remains, and myths.

The earliest anthropological evidence of an amputee is that of a human skull in the Smithsonian Institution 45,000 years old which shows teeth shaped and aligned in such a way that indicate he was an upper extremity amputee, (Wilson, 1978). Other evidence is found in cave paintings in Spain and France, about 36,000 years old, illustrate the negative imprint of a mutilated hand. Later paintings like these were also found in New Mexico and suggest the practice of self mutilation to appease gods in religious ceremonies (Friedmann, 1978). The Rig-Veda, an ancient sacred poem of India, is said to be the first written record of a prosthesis. Written in Sanskrit between 3500 and 1800 BC, it recounts the story of a warrior, Queen Vishpla, who lost her leg in battle and was fitted with an iron prosthesis, and returned to battle.

Some social attitudes toward amputation and amputees remain to this day, while others have changed. Congenital deformed babies may have been killed or ostracised because they may have been judged a functional liability or spiritually unclean. However, King Montezuma II, an Aztec ruler established a special, albeit degrading, compound for the disabled between the royal zoo and botanical gardens (Friedmann, 1978). Amputation was often feared more than death in some cultures as it was believed that it not only affected the amputee on earth, but also in the afterlife.

The ablated limbs were buried, and at the time of the amputee's death, disinterred and reburied so the amputee could be whole for eternal life. Many cultures had a very
physical subsistence and any handicap might have affected an amputee's ability to provide for themselves and contribute to the tribe (Romm, 1988).

The reasons for amputation in ancient times varied. Congenital deformities have always been present. Especially in Arabic countries where first cousins were encouraged to marry. War was often times the cause of traumatic amputation in battle or when taken prisoner. Amputation was also used as a judicial punishment especially in the ancient Moche culture of Peru. Theft was punishable with the amputation of a hand, but if the thief could prove a motive of hunger, the village chief suffered the punishment. A foot was removed for laziness and both arms were removed for rebellion.

In the Arabic countries the right hand was used for eating from a common bowl and the left used for sanitary cleaning. Theft was punishable by the removal of the right hand, effectively ostracising the thief from the social group. Ancient cultures also had knowledge of amputating for diseases such as gangrene, tuberculosis, and leprosy and advised amputation above the diseased area for healing. Religious ceremonies were another cause of amputation with any form of disfigurement allowing the worshipper to appease gods, show faith, or illustrate the altering effect of faith. A ritualized form of this exists today in the form of circumcision (Padula, 1989).

Surgery was performed with or without anaesthesia, analgesics, and fairly advanced tools. For judicial punishment no anaesthesia was used and a guillotine technique with an axe was used. For curative surgery an ancient surgeon used plant extracts such as nepentag, opium, hemp, mandrake, henbane, hemlock, and alcohol. Analgesic plants
such as asperic acid from tree bark were used to relieve pain. Antiseptics such as smoke, honey, wine, niter, and cautery with hot oil were used (Padula, 1989) ligatures of cotton fibre, human hair, hemp, or ant jaws may also have been used in weaving cultures. Tools such as bronze or stone axes were the standard surgical instruments. Saws with stone set into wood or animal jaw bones have been shown to amputate limbs within six minutes (Friedmann, 1978).

The prosthesis of the ancient cultures began as simple crutches with wooden and leather cups shown in Moche pottery. This grew into a type of modified crutch or peg to free the hands for functioning. An open socket peg leg had cloth rags to soften the distal tibia and fibula and allow a wide range of motion (Friedmann, 1978). These prostheses were very functional and incorporated many basic prosthetic principles.

Amputee gods can also be identified. The primary Peruvian jaguar god, Aia Paec (Ai Apec), was an above elbow amputee. Tezcatlitoca, the Aztec god of creation and vengeance, was a right foot amputee. The Celtic Irish god, New Hah, was a left arm amputee with a four digit silver prosthesis (Padula, 1987).

3.6.3 Birth of Science - Egypt, Greece, & Rome

With the birth of these three great civilizations, came the early development of the scientific approach toward medicine and subsequently prosthetic science. Amputation is recorded in myth and plays, and actual prostheses from this era have been found.
Prosthetic limbs made of fiber have been found in the wrappings of Egyptian mummies which were probably the creation of the burial priests rather than a functional device. In a Greek myth Pelops, grandson of Zeus, was killed and cooked by his father, Tantalus, to be served to the gods to see if they could differentiate between flesh of man and beast. Demeter, goddess of agriculture ate Pelops' shoulder, but recognizing her error restored him to life and made a prosthetic ivory shoulder (Romm, 1988).

Aristophanes from the 5th century B.C. wrote a part in his play, "The Birds", for an actor wearing a leg prosthesis (Friedmann, 1978). Herodotus (424 B.C.) writes of Hegistratus of Elis, a Persian seer, who was to be condemned to death by the Spartans. He escaped from the stocks by amputating his foot, making a wooden filler, and traveling 30 miles to Tregea. Unfortunately he was captured at Zaccynthius and was decapitated (Vitali, 1978). A Roman prosthesis from the Samite Wars (300 B.C.) was unearthed in Capua, Italy in 1858 and was constructed of a wooden core, bronze shim, and leather straps (Thomas, 1945; Wilson 1981). Unfortunately it was destroyed during a bombing of London in World War II. Pliny the Elder (23-79 A.D.), a first century Roman scholar, writes in "Natural History" of Marcus Sergius, a Roman general who led his legion against Carthage (presently Tunis) in the Second Punic War (218-210 B.C.) (Romm, 1988). He sustained 23 injuries and a right arm amputation. An iron hand was fashioned to hold his shield and he was able to go back to battle. He was captured and escaped twice and served as Praetor Urbanis or civil judge. He was denied a chance to be a priest because one needed two normal hands (Romm, 1988).
The use of ligatures to tie off bleeders was originally put forth by Hippocrates in the 5th Century B.C. (Wilson, 1978), he also advocated a method for amputation for gangrene. Celsus (0 A.D.) described another technique of amputation through healthy tissue between sound and diseased tissue (Sanders, 1986), and also describes knotting of blood vessels to stop bleeding. There are repeated references to amputation in the Jewish history of the Talmud. Two Roman surgeons, Archigenes and Heliodous, advocated amputation not only for gangrene but tumours, injuries, and other deformities (Sanders, 1986).

3.6.4 The Dark Ages - The Age of Armour

The Dark Ages were, as their name implies, a time in which there was little scientific illumination. The feudal system effectively divided all regions of Europe into many tiny isolated kingdoms. This prevented the scientific process from occurring because no central forum of government or learning existed. Many of the surgical techniques developed by the Greeks and Romans fell into disuse as there were less and less educated people from each region to read, use, experiment, and record their findings. At this time primitive techniques such as crushing the limb, dipping in hot oil, or searing with hot irons were used. The guillotine technique was used and limb the surface was allowed to granulate. Speed was of the essence. Most people died of blood loss and those did not usually succumbed to infection from the dirty surgical techniques. Pus was not only expected but thought of an indication of normal healing. These techniques did not die out until the mid to late 1800's.
There were not very many prosthetic alternatives available to the amputee at his time except basic peg legs and hand hooks. Only the rich could afford to have prostheses made. Knights had prostheses made by their armourer for use in battle. Some of these devices were fairly advanced but were usually heavy, cumbersome, and functioned only in battle. Arms were set to hold shields at all times and legs set to ride in stirrups, but not for daily function such as walking.

When the knight returned home, he usually wore peg legs or hand hooks for daily function. During this period prostheses were more cosmetic than functional; they were meant to hide the disgrace and weakness of defeat from other battles. Armour makers made the prostheses appear as extensions of the knight's original armour. Although physicians had a great knowledge of the human body, they knew little about creating a functional prosthesis. Watchmakers also joined in later to make more intricate internal functions with springs and gears (Friedmann, 1978).

Although most of the recorded amputations have to do with traumatic battle injury, many amputations were due to leprosy. Ergot was a medicinal rye plant that deadened the limbs senses and in some cases caused gangrene. The use of gunpowder and cannon shot at Crecy, in 1346 brought the beginning of the end of the Age of Armour, but introduced a new cause of trauma that would have a great impact in the wars and traumatic injuries to come.
3.6.5 Renaissance - Age of Enlightenment

The Renaissance signalled a rebirth of science and rediscovery of medical practices begun by the Greeks and Romans. As the governing systems of the European countries centralised, cities and universities arose where science and art could grow and be recorded.

The iron arm of the German mercenary knight Gotz von Berlichingen (1480-1562) is an amazingly advanced example of prostheses made at this time. Gotz gained a reputation as a Robin Hood, protecting the peasants from their oppressors. In 1508 he lost his right arm in the Battle of Landshut when friendly cannon fire struck his sword which fell and severed his arm. Learning of another warrior who used a prosthetic iron hand in battle, Gotz had two made for himself. These were mechanical masterpieces. Each joint could be moved independently by setting with the sound hand and relaxed by a release and springs. The hand could pronate and supinate and was suspended with leather straps. Although not body powered, it represented a great attempt at functionality (Romm, 1988).

Other accounts of functional prostheses exist such as the Alt-Ruppin hand, fished from the Rhine in 1858 and dated to the 1400's. A 16th century Italian surgeon recorded in his travels to Asia, a bilateral upper limb amputee able to remove his hat, open his purse, and sign his name. Also a story of a left iron hand made for Admiral Barbarossa who fought the Spaniards in Bougie, Algeria for a Turkish Sultan in 1512 (Romm, 1988). In 1517 Hans Von Gersdoff of Strausburg recommended the use of a
tourniquet with compression from a cow or pig bladder, cautery, and a dressing with warm, not boiling oil. Wilhelm Fabry, the first educated and scientific German surgeon, wrote of amputation above gangrenous level and also described a tourniquet in 1593 (Sanders, 1986).

The greatest contribution to amputation surgery and prosthetics sciences of this time is by Ambroise Pare (1510-1590), a French army barber-surgeon. He reintroduced the use of linen ligatures originally put forth by Celsus and Hippocrates when he ran out of cautery oil during battle surgery. Time was still a limiting factor. A surgeon working with no anesthesia, tourniquet, or skilled aid hand was limited to about 30 seconds to amputate and 3 minutes to complete the operation (Vitali, 1978). This is a very small amount of time for a surgeon to ligate major arteries and is why many, such as Guillemeau, Pare's student, abandoned this method in favour of direct coterie.

It was not until later with the introduction of the tourniquet in 1674 by Etienne J. Morel, also a French Army surgeon, during the Seige of Besancon (1674), that ligation would have more widespread use. Hence amputation became more of a lifesaving technique (Vitali, 1978). Pare also invented upper and lower extremity prostheses that show knowledge of basic prosthetic function. "Le Petit Lorrain" was a hand operated by springs and catches for a French Army Captain, which he then used in battle. He also invented an above knee prosthesis which was a kneeling peg leg and foot prosthesis. It had a fixed equinas position, adjustable harness, knee lock control, and other engineering features used today (Vitali, 1978).
From the 1600's to the early 1800's, we see great refinements of the prosthetic and surgical principles put forth in the Renaissance. The invention of the tourniquet, anesthesia, analeptics, blood clotting stypts, and disease fighting drugs brought medicine to the modern era, but also made amputation an accepted curative measure rather than a last ditch effort to save life. The surgeon had time to make residual limbs more functional, and therefore allowed the prosthetist to make better prostheses.

In 1782, Edward Alanson, an English surgeon suggested an amputation in which tissue was cut in a hollow conical manner using skin flaps. Dominique-Jean Larrey, Napoleon's personal surgeon, utilised ambulances that picked up the wounded immediately. He also tried to use refrigeration as a local anaesthetic and is said to have performed over 200 amputations in 24 hours (Sanders, 1986). Crawford Long of Athens, Georgia, was the first physician to use sulphuric ether for anaesthesia and William Morton, a Massachusetts dentist, proclaimed its use. Pierre Jean Marie Flourens discovered chloroform in 1847. James Syme, Chief of Surgery at the University of Glasgow, Scotland, performed his first innovative ankle disarticulation in 1842 and was followed by a Russian surgeon, Pigoroff, with his own version in 1854. Rocco Gritti of Milan described knee disarticulation using the patella as a protective flap in 1857 (Sanders, 1986). Stypts such as alum, vitriol, turpentine and oil where use to clot blood, but oil may have been used unknowingly as an antiseptic (Vitali, 1978). Even with all this advancement, a patient was susceptible to infection. In 1842 Paris hospitals were said to have a mortality rate of 62%. It was even higher
for amputation patients; even for a digit amputation. Surgeons seemed to lack cleanliness respected even in everyday life.

Literature has suggested that it was safer to have a limb amputated by gunfire, than by a surgeon. As late as 1880, surgery assistants held sutures in their mouths. Acting on studies of Englishmen, Monro (1752), and Alanson (1782), Joseph Lister, son-in-law of James Syme and now Chief of Surgery at the University of Glasgow, experimented with antiseptic surgical techniques in 1865. His results were not published until 1867. These were not brought to the U.S. until 1877 by Captain Gerard. So it was only 114 years ago that doctors started washing their hands in the U.S. Lister also advocated using catgut as a suture alternative since silk and hemp caused inflammation and severe haemorrhaging (Sanders, 1986).

3.6.7 Development of Prostheses - 1600 to 1800's

Many of the prostheses developed during the 1600's were merely refinements of earlier armour type devices. They were bulky and heavy, but gradually gained more function. A number of pieces are housed in the Stibbert Museum, Florence, Italy. Some of these devices show contributions of other artisans such as watchmakers and woodworkers. They exhibit more functionalism and sacrifice aesthetics indicating more common use.

In 1696, Pieter Andriannszoon Verduyn (verduuin), a Dutch Surgeon, introduced the first non-locking, below knee prosthesis. It bears a striking similarity to today's joint and corset prosthesis. Like the joint and corset, it was made of external hinges and a
leather cuff that bore weight. The leg cuff socket was lined with leather and had a
copper shell and had a wooden foot (Romm, 1988).

James Potts of London designed a prosthesis in 1800 that consisted of a wooden
shank and socket, a steel knee joint and an articulated foot that was controlled by
catgut tendons from the knee to the ankle. It was used by the Marquis of Anglesey
after he lost his leg in the Battle of Waterloo and become known as the "Angelesey
Leg". Flexion of the knee caused dorsiflexion of the foot and extension of the knee
caused plantar flexion of the foot. It has also been referred to as the "Clapper Leg"
because of the noise it made with wooden foot stops or the "Cork Leg" since it was
widely used in County Cork, Ireland. William Selpho then brought the Anglesey Leg
to the U.S. in 1839 (Sanders, 1986).

In 1846, Dr. Benjamin F. Palmer, a patient of Selpho, obtained a patent for his leg
which improved on the Selpho leg by adding an anterior spring, smooth appearance,
and concealed tendons. It was honoured in 1851 at the London World's Fair: "It
imparted a life-like elasticity and firmness to the step" (Thomas, 1945).

Dr. Douglas Bly of Rochester, New York invented and patented "Doctor Bly's
anatomical leg" in 1858. He called it "...the most complete and successful invention
ever attained in artificial limbs" (Thomas, 1945). He is said to have first introduced
the curved knee joint. The prosthesis also allowed for inversion and aversion through
the use of an articulated ankle: a polished ivory ball in a socket of vulcanized rubber.
However, Doctor Bly does admit that his invention has limitations.
"Though the perfection of my anatomical leg is truly wonderful, I do not want every awkward, big-fatted or gamble-shanked person who always strided or shuffled along in a slouching manner with both his natural legs to think that one of these must necessarily transform him or his movements not specimens of symmetry, neatness and beauty as if by magic- as Cinderella's frogs were turned into sprightly coachmen.” (Dr. Douglas Bly, 1858).

The Angelesy leg became known as the American leg, when A.A. Marks in 1856 gave it knee, ankle, and toe movements and an adjustable articulation control. In 1818, Peter Ballif, a Berlin dentist, first gave the upper extremity prosthesis prehension control with a shoulder harness with and a chest strap. This same principle was used in 1844 by a Dutchman, Van Peetersen, for elbow flexion. In 1867 Comte de Beafort published and illustrated an elbow flexion lever device mounted on the chest that he had developed in 1855.

3.6.8 The American Civil War - The Age of Enterprise

The American Civil War (1861-1865) marked the first example of modern warfare and the post war industrial revolution began the age of enterprise. It was fuelled by the "Great Civil War Benefaction" by the U.S. Government which fuelled competition by providing prostheses to veterans. This was a government's first commitment to supply prostheses to veterans and whose support plays a major role to this day. New designs of prostheses were constantly being made. Extraordinary claims were made in the name of attracting business and veterans' money. Many of the ideas were only
superior to a select number of patient cases. No real systematic prosthetic prescription was as of yet devised. Shysters and charlatans dot the history at this time.

There were a great many amputations (30,000 in the Union Army). In 1962 the government guaranteed prostheses for veterans who lost them in the war. A southern soldier, J.E. Hanger, who lost his leg in 1861 replaced the catgut tendons of the American leg with rubber bumpers to control dorsiflexion and plantarflexion and he used plug fit wood socket. He then opened a clinic in Richmond, Virginia. Later the rubber foot, the forerunner of the SACH foot, (Solid Ankle Cushion Heel), came into use and eliminated the complicated articulate ankle of the Bly leg (Sanders, 1986).

In 1863, Dubois D. Parmlee invented an advanced prosthesis which had a suction socket, polycentric knee, and multi-articulated foot. In 1868 Dr. August Gustav Hermann of Prague suggested using aluminium instead of steel (Sanders, 1986).

Additionally the late 1800's saw the US government invest money in creating many "clinics" until 1917, when there were about 200 clinics and 2000 skilled workmen in the USA with many extraordinary claims being made such as those regarding the Bly leg. Many of the manufacturers were amputees themselves, and thought their inventions were a cure all, but in reality they fitted their requirements and a select patient group.

Around 1912 with the budding aviation technology, an English aviator, Marcel Desoutter, who lost his leg in an plane accident, made the first aluminium prosthesis with the aid of his brother, Charles, an aeronautical engineer. This was followed by a
similar advancement by Hanger. Other inventions developed by Desoutter and Hanger such as the development of pelvic suspension rather than shoulder suspension, provided a more efficient and stable way of operating the prosthesis and direct knee control. This led to knee control systems such as the knee brake. As World War I began, prosthetists were a mixed group. They were at times less concerned for patients needs rather than their own greed and pride. Surgeons were reluctant to confide with them because they were frequently ambulance chasers "sort of shysters preying on the amputee."(Thomas, 1945). This set the stage for leaps in technology during the two World Wars into the modern era.

3.6.9 The War Years - World War I, Depression, & World War II.

As World War I (1914-1918) began, American prosthetists remained a very independent, competitive group; rarely working with surgeons let alone each other. Amputee casualties in the U.S. (4,403) were much smaller than the British (42,000) and European armies (100,000). This resulted in European prosthetists jumping ahead in experimentation of their American counterparts (Sanders, 1986).

Recognising the lagging of care for amputees in America, The Surgeon General of the Army invited the U.S. prosthetists to Washington, D.C. to discuss prosthetic technology and its development. From this meeting arose the present day American Orthotics and Prosthetics Association. This development as one historian writes "contributed more to the development of the science of prosthetics than any other occurrence in its history" (Thomas, 1945). Though this forum prosthetists could
develop ethical standards, scientific programmes, educational programmes, and build better relationships with other health professionals (Sanders, 1986).

In 1918, Dr. Martin described the Belgian prosthesis, which emphasised the anatomy and physiology of the leg. This prosthesis was an improvement on the standard American leg. It could reproduce the natural static and aesthetic appearance of the lower limb and was made from measurements and a modified cast of sound and residual limb.

Because of the relatively low amount of amputees in World War I and the economic depression in the USA, prosthetics advanced very little to the beginning of World War II, with many of the European advances had not yet reached America.

As World War II waged on, the American amputee casualty list was much greater. These veterans found the current technology (which had not changed all that much since the 1800's) inadequate. In response, Normal Kirk, Surgeon General of the Army, requested that the National Academy of Sciences investigate the prosthetic state of the art. Originally it was thought that only a few designs and studies were necessary. But it soon became apparent, when the Surgeon General brought in a team of engineers and surgeons from Europe in 1946 that the U.S. lagged far behind. At this time the orthotists joined the American Limb Manufacturers Association making it the Orthopaedic Appliances and Limb Manufacturers Association. In 1950 the name was again changed to the American Orthotics and Prosthetics Association or A.O.P.A.
3.6.10 Modern Era - Research & Development

These developments led to a rapid advance in prosthetic science research. The Artificial Limb Program was sponsored by the Veterans Administration, H.E.W., and the Armed Services by establishing a number of research laboratories. The University of California at Los Angeles became a centre for upper limb study. Similar research was carried out by the Navy at Oakland Naval Hospital, U.S. Army Air Force, at Wright Field, Northup Aviation, Catranis, and New York University. Socket designs such as the quadrilateral and Patella Tendon Bearing (PTB) were investigated and refined further at this time. Materials were also improved. Northrup Aviation introduced the use of thermosetting resins to form custom fit socket and structural components. This led to the development of the SACH foot. Total contact now became possible along with clear check sockets. Prosthetic knees such as the Mauch S-N-S system were developed (Wilson, 1981).

Educational seminars for these new techniques and components began in 1947 and pilot courses sponsored by the University of California at Berkeley in prescription, fabrication and alignment of the Above Knee prosthesis. These courses were followed up by workshops by Veterans Administration and the Orthopaedic Appliance and Limb Manufacturers now, the AOPA (Wilson, 1981).

The American Board for Certification was created in 1949 to evaluate and certify prosthetists according to a set standard. This educational growth continued into the 1950’s in 1952 UCLA (University of California at Los Angeles).
began offering 6 week short courses and on a regional basis from 1953 and 1954. About 140 Veterans Administration (VA) and civilian teams were created. In 1956 UCLA began offering formal above knee (A.K.) prosthetics courses. Because UCLA could not answer the countries growing prosthetic educational needs, the VA established a prosthetic post graduate educational program at New York University was set up in 1956. The office of Vocational Rehabilitation (now Rehabilitation Services Administration) of H.E.W. sponsored the establishment of a prosthetic program at Northwestern University at Chicago in 1959.

1956 marked the development of the SACH foot from the University of California and in 1959 the PTB prosthesis was created at University of California at Berkeley. In 1960 the Stewart-Vickers hydraulic leg became available and was improved with the Hensche-Mauch S-N-S systems. In 1968 the modern hydraulic Hensche-Mauch S-N-S knee was developed when it became apparent that hydraulic support in swing was not adequate.

Additionally the "Thalidomide Tragedy" also increased the impetus for the development of more advanced prosthesis due to the explosion of physical abnormalities and deformities. Caused through the prescription of the drug Thalidomide, between 1957 and 1962, originally introduced as a sedative but later used to suppress the symptoms of morning sickness (Marquardt E and Fisk J. R, 1992) (Appendix A)

Different prosthetic procedures resulted when prosthetists began working with surgeons. Marian Weiss of Poland experimented with immediate post surgical fittings
in 1963. That same year, Guy Fajal of France developed the PTS or PTB SC-SP and also New York University unveiled a BS degree in Prosthetics and Orthotics.

1964 brought preparatory fitting to the U.S. from Dr. Burgess of Seattle. 1967, Carlton Fillaur of Chattanooga refined Dr. Gotz-Gerd Kuhn's B.K. Prosthesis and brought it to Chattanooga Tennessee as the removable wedge. 1970 marked the inaugural year for the international Society for Prosthetics and Orthotics. In 1971 Endoskeletal components, became available with a soft form cover. 1974 to 1976 the STAR, Hosmer and ROL rotational units were developed and in 1980 the SAFE foot (one of the first "energy storing feet") was developed.

Some work was done in Germany on other types of devices including external power and other techniques, but it was IBM who first perfected external power in 1949. 1958 saw a Russian external powered prosthetic controlled by muscle contraction flexors and extensors. Otto Bock Orthopaedic industry has since refined this to a commercial product.

From the literature it is evident that there has been rapid development in both the technology and in the patients emotional and personal needs. This shows that people will always want better and more realistic products that the manufacturers must develop or suffer the consequences.
3.7 The Need for Prosthetics Development

The general issue connected with disability is one of lack and inferiority resulting in the inability to pursue a full and active life. This formed the basis for establishing that the primary cause of this is the level of adaptation that the disabled person has acquired towards their prosthetic and disability, both on a physical and psychological level.

It is therefore fair to argue that this inability and lack must be corrected by addressing the core problem, that the prosthetics are unsuitable and do not facilitate the users in obtaining their previous or an adequately comparable standard of mobility/ability with other non-disabled persons. This has been substantiated historically, as it has always been recognized that in order to function on an equal level as non-disabled persons it is necessary to achieve an equal mobility and functionality. From the earliest manifestation of the articulating prosthetic in 1509 built for the German Knight, Gotz Von Berlichingen (Lehneis, 1993), the need for the prosthetic limb to mimic the original organic limb in its physical appearance and its facility has been clear.

Recent advancements have enabled the disabled to participate in the historically able-bodied realms of athletics with many amputees taking part in sports that 20 years ago were the sole field of the professional able-bodied athlete. Track and field events have recently seen unexpected triumphs of technology and determination over disability, such as the unofficial 200m running record being set by Aimee Mullens who had her legs amputated at the age of one. It is only a matter of time before the disabled athlete competes physically with their non-disabled counterparts as Amiee Mullens time
record of 34.05 seconds testifies when compared with the two footed 21.34 seconds of the world record holder Florence Griffith-Joyner.

It is fair to say that this technology is in its infancy and it is only through the continued demands and ambitions of the disabled that it will advance further. Indeed it has been said that the research that has been undertaken in order to help the disabled regain or gain a better standard of life, is the fore runner of technologies which will enhance and aid human evolution.

A true advancement of prosthetics and the technologies behind it is recorded following the involvement of the United States in the latter stages of the First world war (1914-1918). Although the US suffered from limited casualties in comparison to the European nations it saw an increased interest in prostheses, associated largely with the spread of business, the telephone and the printed advertisement (Kurzman, 1998).

Following this and the Second World War, (1939-1945), the United States government undertook two ground breaking advancements. Firstly the contracting of American weapons based companies to produce spin off prosthetics technologies and secondly the institutionalization of prosthetics education, creating a science rather than a trade (Kurzman, 1998).

It can therefore be argued that the advancement of prosthetics from the craftsman carpenter to the prosthetist, was largely due to the necessity of increased numbers of amputees following these major wars. In addition however it has been speculated that
this increased awareness and willingness to address the issues of physical disability could have been related to two key factors.

The first factor being the case following the First World War was the increased use of the telephone, improving communication and spreading by word of mouth the improving craftsmanship behind prosthetics thus propagating a boom.

The secondly factor the Second World War, and the instigation of conscription in 1939 in the United Kingdom and in 1940 in the United States which required that all able bodied men between the age of 18 – 41 were to join the armed forces. Therefore it was inevitable that there would be a shortage of healthy men in the years following the war. As a result there was an increased investment in prosthetics research and development (Kurzman, 1998).

56 years on from the second world war, what are the current reasons behind the demand for improvement? The 1885 theories of Charles Darwin (Darwin, 1885) in his pivotal work “On the origin of the species by means of natural selection or the preservation of favoured raced in the struggle for life” other wise know as the “Origin of Species” it may be argued that one of the needs for an amputee to wear a prosthetic is possibly the primitive action of self-defence (Nicholas, 1993). The animal world is full of examples of the survival of the fittest, therefore naturally the weak are pray for the strong, with in this particular case the defence mechanism being the ability to blend in and survive.
This may also be a driving force behind the need to advance the technology behind prosthetics. The human need to socialize and communicate with our kind is facilitated by our ability to conform to our surroundings, both environmentally and socially. One example of this is the advancements within cosmetic prosthetic covers. At one time the only covering available was a wholly unrealistic salmon pink paint, that was slapped on with little or no interest in the prosthetic resembling a real flesh limb. Today however a vast amount of research is going into creating coverings that not only closely resemble the users skin pigmentation but also have vein’s and hairs, as well as an original organic shape.

This need has also increased due to a greater acceptance and understanding of the disabled within the community. No longer is disability institutionalized. It is understood that disability in the true sense, could affect any one at any time. In turn this increased acceptance has allowed many barriers and social taboos to be dissolved, again opening doors of opportunity. Today the disabled are only limited by their own inhibitions, we have amputee pilots, doctors, teachers and even the cosmetically driven industry of modelling has examples of amputees, such as, Heather Mills from the United Kingdom (Sayid, 1995).

This of course in not to say that social barriers do not exist but the more technology can be advanced to facilitate the full absorption of the physically disabled into society the quicker those barriers will come down.

Another more obvious conclusion that must be drawn from the need to advance the field of prosthetics is the implications associated with user health. As we have seen
the increased mobility and physical exertion in comparison to immobility following amputation or deficiency, is in its self a vital part of the advancement of the technology. The need for a smooth transition into the full acceptance and use of a prosthetic is paramount. The beneficial reduction of pain, discomfort and fatigue created by modern limbs is pivotal in the user's ability to establish or regain a high if not comparable level of activity. Coupled with the reduction of mental stress and possible depression makes the advancement of this technology crucial to the inevitable future and current recipients.

In addition the improving standards of prosthetics and how they allow the user to actively contribute to society is again very important. As we saw earlier the pressures on such social care initiatives as the welfare state and the health authorities is immense, with the impact of disability and its connected issues putting greater strain on an already stretched system. Therefore augmentation in prosthetics and the consequent reactions improving standards of health, mobility, education and earning potential will eventually reduce this strain.

In conclusion the need for human betterment is at the core for our need of stronger, lighter and more realistic prosthetics, to enable full participation in society.
 CHAPTER 4

AN ASSESSMENT OF THE AMPUTATION AND LIMB FITTING PROCESS

4.1 Introduction

The success of a prosthetics user in regaining or attaining a high quality of life is largely dependant on their willingness to persevere, with what is inherently an alien situation as wearing a prosthetic. Key factors such as amputation configuration, materials technology, new products as well as prosthetic design considerations all contribute to the successful rehabilitation.

This chapter illustrates current developments focusing on the issues that impact on the design and production of lower limb prosthetics, giving particular consideration to the below knee user.

4.2 Amputation Level

Amputation in medicine is defined as the removal of any part of the body, commonly restricted to the surgical removal of part or the entirety of the upper or lower extremity (Kruger, 1988) through such reasons as injury, disease or trauma. In addition to the more commonly occurring forms of amputation through affected disorders, the appearance of congenital limb deficiency or congenital amputation, sometimes necessitates the surgical amputation of malformed or stunted extremities to aid the figment of prosthetic devices.
Surgical amputation may be a lifesaving measure following injury due to the effects of blood loss and infection. Additionally as earlier stated the diabetes sufferer is prone to infection, often resulting in the presence of gangrene and the unfortunate amputation of the affected limb as this is frequently the only method of preventing its spread.

Previous approaches to the management of limb deficiencies have been more concerned with bracing or the use of orthotic devices designed to restore length and permit mobility, the only certain result being that such individuals would be identified as "cripples". Today's approach is the conversion of limb abnormality to an amputation. This is conducted to facilitate the appropriate fitment with a modern prosthetic so that the individual is viewed as a whole. This is an issue of great importance to the individual's psychological development, as well as relationship construction, schooling and vocational decision making. In both cases the amputation of a limb is conducted in order to re-establish quality of life, with primary consideration given to the restoration of function, as distinguished in childhood through the participation in sports or social activities when compared with the perceived normal child.

4.3 Amputation Selection Process

The probability that an amputee will successfully be rehabilitated is vastly improved by the operating surgeon's experience. However, even the most experienced of medical professionals may not instantly establish the most viable level of amputation,
therefore additional objective tests are employed to supplement clinical examinations. Special significance is given to tests where amputation will seriously affect the mobility of the patient, as in cases where amputation must be specially designed to accommodate and aide the preservation of the knee joint (Kruger, 1988).

The multidisciplinary team including the surgeon can call upon many objective tests including systolic pressure measurement, skin blood flow measurement, transcutaneous oxygen measurements, infrared thermography, skin fluorescence, and many others to supplement the vast experience of the surgeon.

Although the prosthetist has a wealth of knowledge and experience at his or her disposal emphasis has been placed on the importance of skin viability especially in the case of the below knee amputation (Young et al, 1978).

4.4 Basic Amputation Variations

Despite the many precautions and advancements in the fight against trauma and disease amputation is often inevitable although with reluctance, however, careful consideration to maximise the mobility of the patient is foremost in the mind of the surgeon. Obviously the severity and positioning of the affected area greatly impacts on the level of amputation with consideration being given to the retention or improvement of blood flow and or preservation of desirable muscle tissue and joints. Consideration is often given to the height of the amputation with great impetus being applied to the retention of length, with preference given to more distal amputations.
Such amputations require the surgeon to have a detailed knowledge of amputation location techniques, in addition having appreciation of the follow up requirements of the orthopaedic device or the prosthetic that will eventually be prescribed to the patient. The particulars of each case are unique but there are certain guidelines in which the surgeon can function in reference to the level of the amputation although these are decisions made at the discretion of the surgeon.

4.4.1 Possible Heights for Amputations of Lower Limb Extremities.

Toe Disarticulation
Trans Peripheral
Resection of Metatarsal heads
Transmetatarsal Proximal
LISFRANC
BONA-JAEGAR
CHOPART
Calcanectomy Partial / Complete
Calcanectomy and Talectomy
PIRGOFF
SYME
Below-Knee Long
Below-Knee BURGESS
Below-Knee BRUCKER
Knee Disarticulation
Transcondyloid Amputation
Above-Knee Amputation

Hip Disarticulation

Hempipelvectomy / Hemipicorporectomy

(Greitmann, 2000).

The following is a brief explanation of a few of the above forms of amputation dependent on appropriate treatment as a result of causation and surgical team assessment:

(a) Toe Disarticulation.

The amputation of the toe is mainly resultant through ill-fitting shoes causing pressure which in turn adversely affects the joint heads ultimately restricting or terminating movement (Greitmann, 2000).

(b) PIROGOFF Amputations.

The long lever arm of the PIROGOFF leads to a strong residual limb capable of weight bearing making this technique especially useful to traumatic injuries or tumours. The PIROGOFF amputation (generally through ankle) is a diss-articulation above the talus, resection of the malleoli placing the calcareous underneath the tibia.

Although this amputation technique proves successful in most cases it proves problematic to patients suffering from circulatory issues such as diabetes due to the occurrence of osteoarthropathy which in turn delays the ossification and a longer time for recuperation.
Although the PIROGOFF amputation technique is very successful prosthetic management can be problematic due to the PIROGOFF amputation leading to a loss of height on the residual side. As a result the fitting of a prosthetic foot leads to an elongation on the residual side necessitating the other side to be modified (Greitmann, 2000).

(c) SYME amputations.

Again as with the PIROGOFF the SYME amputation is fully capable of weight bearing being separated at the subtalar joint. The only problematic issue connected with the SYME is the cave shaped wound which is susceptible to infections and soft tissue displacement, especially of the skin directly underneath the residual limb.

The SYME amputation presents several difficult factors least of all its susceptibility to infection but more importantly is the correct surgically location of the arteries so as to protect and assist in the healing process in turn aiding the total weight bearing properties of the residual limb once healed (Greitmann, 2000).

(d) Below-Knee amputation.

Amputation of this nature following trauma or tumour makes it easy to attain a suitable length and a satisfactory conclusion to prosthetic management. However in the case of the diabetic patient the surgeon has two options for a desirable outcome, the first being short residual limb or a ultra short residual limb. Both techniques are adopted due to the thickness of the tibia and the problem with attaining enough soft tissue covering with longer amputation.
The BURGESS technique employs the use of a short residual limb with a long dorsal lobe, this technique is specially designed with a view to improve prosthetic management and movement of a patient with a modern PTB prosthetic (Greitmann, B 2000).

4.5 The Fitting Process

Up on completion of the surgical amputation of the limb the patient is ready to receive their first prosthesis. This occurrence is often met with a level of trepidation, with the patient being both excited and daunted by the procedure and the unfamiliar sensations connected with the loss of a limb (Kohl Sybil, 1984).

Patients often feel depressed, except for those for which amputation has given relief from prolonged periods of pain. Any possible depression is quickly replaced in most cases by a drive to return to an active life, however, there is an apparent correlation between the patients psychological condition prior to surgery and their reaction to their disability (Uellendahl, 1998).

4.6 The Early Healing Process

The fitting of a prosthetic limb is often physically demanding so it is often the case that the residual limb following surgery is in no condition to undergo the riggers of the fitment procedure. Due to this a period of healing is required and is usually refereed to as either primary or secondary healing depending on the severity of the trauma.
Primary healing refers to any healing following a surgical wound, which generally is conducted with minimum tissue damage, making the healing time greatly shortened. Secondary healing is used to describe instances where an open area is remoulded resulting in an increased healing time and risk of scaring and infection as well as the abnormal growth of differing tissues known as adherence, (Liija, and Johansson, 1993).

In both cases the residual limb or stump following the removal of the surgical stitches is newly wrapped each day in bandages. This is to aide the shrinking and shaping process, additionally the stump undergoes a great deal of massaging and exercise intended to strengthen and desensitize, as well as reduce the threat of serious adherence (Liija, and Johansson, 1993).

4.7 Initial Prosthetic Fitment - The Temporary Prosthesis.

Obviously the healing process and the duration is dependent upon the health levels of the patient and the circumstance by which the amputation is undertaken, with prosthetic fitting being conducted as soon as possible. Therefore the stump is usually dressed with either the “soft” technique with ordinary cotton bandaging, or alternatively the “ridged” with plaster-of-Paris.

The “ridged” technique is often used to facilitate this early prosthetic fitment, allowing the residual limb or stump to heal for a period of between 10 to 14 days, in which most of the healing process actually occurs. This facilitates the basic
concurrent gait and walking training, with the rudimentary fitment of an aluminium tube and foot which is temporarily aligned. This temporary prosthesis also hasten walking or gait training before the residual limb has completely healed and improve the psychological well being of the patient, who may well have been confined to a wheelchair for a considerable period.

An alternative to the “ridged” technique is the use of the “soft” dressing technique. Used to encourage circulation the stump is wrapped in elastic bandages, frequently being reapplied throughout the day so increasing blood low and aide shaping.

Supplementary to either of the dressing techniques, the importance of physiotherapy is paramount with regular exercise critically reducing the onset of many secondary conditions including muscle contractions, which can hamper the patients use of the prosthetic. This early prosthetic fitment also helps combat oedema, a condition characterized by the collection of fluid in the cavities or tissues of the residual limb, which can become infected and lead to the onset of gangrene.

The use of the temporary prosthesis continues in most cases for several weeks or months or until the stump has stabilised, upon which the preparatory prosthesis is fitted. This so called stabilization is concerned with the shrinkage that the residual limb undergoes during the healing process. This makes the fitment of a permanent limb uneconomic, wasting both time and labour, as the changing shape of the stump demands that the limb can be easily and frequently altered, therefore aiding the correct manufacture of the permanent limb when it is time.
Whatever technique is adopted its intention is to promote the optimum environment for the rapid healing and allow early casting and limb fitting. Therefore other less frequently used healing techniques have been developed and are used in particular situations. One such technique is the free stump technique. Although not the first choice of many prosthetists this technique is sometimes employed in the treatment of the above knee amputation, the technique allows the stump to heal without the aide of bandages inevitably often resulting in increased levels of pain.

The controlled environment treatment is probably one of the most expensive techniques available to the prosthesis. Developed in 1978 by Redhead and Snowdon (Redhead and Snowdon, 1978) in an attempt to create a method by which to accurately control the healing of the stump. Enclosed in a Sterishield with a distal air inlet. The system allows for the control of pressure cycled between low and high at a controlled temperature. This combined with the sterile air within the unit facilitates peripheral circulation and reducing oedema (Troup, 1980). One significant drawback however is the limiting effects of the apparatus as it relies on the continued connection of the machine and air hose to the patient.

4.7.1 Stump Measuring and Tissue Evaluation

Upon satisfactory healing and stump tissue stabilization the true expertise of the prosthetist is utilized to its fullest, setting them apart from the other members of the interdisciplinary medical and surgical team. At this stage it is vital to capitalize on the already well establish levels of cooperation and interaction between the patient and prosthetist created within a relaxed, reassuring and comfortable environment.
At this stage the needs and expectations of the patient have been assessed in conjunction with their capabilities, with plans being drawn up as to what prescription limb will be most suitable in the delivery of the highest possible standard of life. This is established with the aid of the detailed build up of patient facts since the initial medical and surgical assessment.

Therefore, at this stage two sets of data are required the first being used to obtain appropriate components and configure them correctly and the second set being stump measurements, required at this stage due to the stabilization of tissue. From which an accurately socket can be produce by one of several means the most universally used being plaster of Paris bandages due to its simplicity and cost efficiency.

In addition to the physical reproduction of the stump shape through the plaster cast, the prosthetist acquires further information marking areas of relevance along the stump. Paying special attention to factors such as tissue compression, pressure tolerance, skin mobility, and motion range, all of which will aide his evaluation of the socket manufacture and help in its modification if necessary.

The completion and modification of the socket through the process must be conducted in accordance with and adhering to anatomical principals, varying with the level of amputation and the socket function. In essence being applied with consideration and appreciation of the condition and shape of the patient's stump.
Fundamentally, however two principles are applied which are common to all socket styles and amputation types. The first refers, to the amount of applied pressure being directly in proportion to the ability and suitability of the tissue to sustain the given load. The second principle referring to the volume of the stump being as close a facsimile as possible to the socket, so as to facilitate and aid many factors including, load bearing, walking and stationary stability, prosthetic retention and patient comfort.

From this modified positive model either a definitive socket can be produced for the final prosthesis or a preparatory socket (check socket) can be produced. The latter being widely used for a variety of reasons, including the speed, ease and cost effective by which a socket of this nature can be formed which reduces the prosthetists emotional attachment to the socket again helping objective evaluation.

4.7.2 Preparatory Prosthesis and Alignment

Upon the satisfactory healing and stabilisation of the residual limb by whatever technique the patient is ready to be fitted with the preparatory limb. However, it must be stated, that not all do, with the prosthetist deeming this stage unnecessary preferring to fit the definitive prosthetic as soon as possible providing the patient, tissue and stump have satisfactorily healed and dealt with the amputation and fitting procedures positively.

The preparatory limb facilitates the manufacture of a more accurate fit and alignment. Being cast in the same manner as the temporary prosthesis by means of plaster of
Paris bandages around the residual limb, leading to the production of a transparent diagnostic socket, aiding the prosthetist to clearly see the fit around the residual limb. With the aim being to get as accurate a fit, alignment and contour as possible from which the final prosthesis can be cloned.

The term alignment can be split into two distinct areas, the first being bench-aligned prior to presentation to the patient. This is carried out according to strict biomechanical principles and recorded measurements known to control the behaviour of that particular class of prosthesis and generally proceeds quickly.

The second form of alignment can be more problematic as it relies on the subjective impression of the patient. This can often be misinterpreted by the prosthetist. Therefore a series of fixed questions are asked designed to provoke a stereotypical response so that the prosthetist can establish the true meaning of the patient's reactions and impression towards what is an unusual group of sensations.

This preparatory stage gives the prosthetist the chance to make fine alterations to the prosthesis. Making custom fitting adjustments to best suit the patient, including the repositioning if necessary of weight bearing areas, smoothing out of any sharp areas and if required the enlargement of any areas that are interfering with soft tissue, bone or scars. This stage can take as long as several weeks or as little as a few days depending on the patient's perseverance and the presence of additional skin conditions.
Additionally this stage can be useful in establishing the type of shoe that best suits the patient and limb. This is primarily due to the fact that heal height has a major impact on the alignment of the prosthesis and in turn may adversely affect balance, walking ability and comfort. Also unlike a flesh and bone limb the prosthesis is unable to adjust automatically to the shoe that the patient may be wearing. Therefore it is generally decided that shoes with a uniform sole and heal height will be used.

This period also establishes comfort perimeters for the patient, helping them recognize the type of suspension if any required to keep the limb on and the number of socks that the patient feels comfortable in wearing. Although it is generally agreed that there should be at least one to aid ventilation and protect from the effects of rubbing. The number of socks is entirely up to the patient with some desiring to wear several woollen socks and others requiring one or two cotton, periodically varying the quantity to account for shrinkage. Such socks must be changed daily and washed according to the manufacturer’s instructions so as to limit the threat of dermatological problems and reduce any potential odour. Furthermore many amputees chose to wear a specially woven sock between the skin and the regular prosthetic sock, which provides additional absorption and allows perspiration to escape to the prosthetic sock.

4.7.3 The Definitive or Permanent Prosthesis

Some one hundred and fifty days post-amputation the final permanent limb is fitted. Which according to Fernie and Holliday (1982) is the best estimated time upon which
shrinkage should have stabilised. A view confirmed by Lilja and Oberg (1997) who state in their study, that by day 160 postoperative all amputations had normalised.

The permanent prosthetic in most cases where the amputation has been between the knee and ankle consists of three major parts: a socket, a shank, or shin and a foot with the most popular choice being the Patella-Tendon-Bearing (PTB) design where all the patients weight is carried through the stump.

The PTB socket usually encloses the stump and contains a soft liner as cushioning, although some amputees prefer a hard inner as they consider it cooler. The socket can be held in place in many different ways including suction or brim shape.

Sockets are generally made in plastic but due to some patients being allergic, occasionally they are made of leather. The shank is either crustaceaen being hollow or pylon having a supporting tube up its middle which have mechanical provision for alignment adjustment, both of which are covered by foam and a cosmetic flexible skin (Muilenburg et al, 1996). This time Muilenburg et al argue is traumatic for the new amputee who understandably is expectant of a prosthetic covering that is indistinguishable from their removed limb or their other sound limb. As a result these expectations are rarely or seldom met, and it is only through the patients perseverance and ability to practice walking and natural locomotion that they will be unidentifiable as an amputee.

Upon completion of the fitting and rehabilitation process the patient and indeed new user must come to terms with the continued re-education connected with the pressures
of having to deal with what is still an inherently alien connection. This will include
the alteration and adaptation to every day activities, previously taken for granted.
Patients will need to build up a wearing tolerance and rebuild their stamina,
modifying muscular activity necessary for walking with a prosthesis and
accommodating for the increase in energy expenditure, (Gauthier-Gagon et al 1998).

Furthermore patients will require follow up treatment and monitoring, periodically
requiring new prosthetics with the frequency depending on age and growth rate if the
patient is within the years of physical growth typically newborn to maturity.

4.8 Conclusion

Decisions regarding the level of amputation are dependent upon many factors and
should be made by a multidisciplinary team in conjunction with the patient where
possible. It is important that the best course of action by which the patient's potential
to establishing an active life following prosthetic prescription is achieved. As well as
reacting to and accommodating their needs where ever possible so as to aid the
psychological state of the patient, thus reducing the effect of depression which is in
many cases frequently connected with amputation.

In addition the adoption and awareness of surgeons to the importance of limb length
retention is vital as it is recognized that the longer the distal length of the stump, the
better control the patient has. Additionally greater length can improve prosthetic
management and give way to more prosthetic options.
Although the initial trauma of undergoing the amputation and the rigours of the prosthetic fitting are completed relatively easily in most cases, the patient must now work their hardest in attaining a high quality of life. It is feasible that following perseverance and hard work the amputee will achieve goals on an equal par to their non-amputee counterparts. Again through perseverance the initially cumbersome and tentative movement may be improved to an extent where the amputee is indistinguishable as such.

This whole process of rehabilitation is dependent on the patients intent and drive to attain their previous or a feasible level of mobility and activity, with no amount of technological advancement or prosthetist knowledge drastically improving the amputees situation.
CHAPTER 5

AN ASSESSMENT OF THE ISSUES OF IMPORTANCE TO THE AMPUTEE
WITH REGARDS TO PROSTHETIC SATISFACTION

5.1 Introduction

The previous chapters have presented a background to the research, illustrating the reasoning behind the evolution of the prosthetics field and the impetus for development in relation to the disabled person. In addition, factors which have lead to technical advancement and the addressing of the disabled persons needs and demands have been explained.

This chapter looks at issues of importance reported by the prosthetics user/amputee which intrinsically affects patient/user satisfaction with their prosthetic and the identification of the measurable variables. Literature within the field can be basically categorized into two distinct areas: firstly, the psychological and secondly, the technological. These two distinctive areas can be used to measure the appropriateness in use of the prosthetic and issues of importance to the patient.

Psychological based arguments primarily suggest that the individual holds an idealized physical picture of themselves, which is used to measure concepts relating to body image, in turn affecting psychological wellbeing, resultant from invested significance in the body, well beyond functional capabilities. Breakley (1997) argues that this over emphasis on the physical nature of an individuals body as explained in
section 2.5.1, can often impact on other aspects of the disabled persons life including their social interaction and therefore their educational standards, career and relationships. It can therefore, reduce satisfaction with the prosthetic and potentially lead to negative psychological characteristics.

The technological arguments stem from the direct assessment of patient/user needs in respect of the prosthetic, whether these needs are being fulfilled or need further development or investigation. Reported issues of importance to the patient/user such as the energy expenditure while walking and the comfort of the socket/prosthetic are continually explored and revised in an attempt to satisfy the increasing demands of the amputee population.

Issues of importance within both these fields are often as a result of judgements by the “experts” in the field, being specialised or specific, resulting from subjective evaluation through experience. However, issues of importance have increasingly been assessed from the perspective of the patient/user through verifiable studies.

Through such studies and literature within the prosthetic field it has been possible to identify issues of importance to the patient/user facilitating the qualitative measurement and evaluation of prosthetic satisfaction. These are issues of importance, which will be outlined within this chapter identifying measurable variables and sub-variables.
5.2 An Introduction to the Issues of Importance to the Amputee

Literature reviewed identified that several studies have used a similar set of variables and sub variables to those identified for this study as a result of the questionnaire deemed the most suitable measure of patient satisfaction. However, this study has modified the existing methodological approach although using aspects of other studies in the field such as Legro et al, (1999) which also reported on issues of importance to persons with lower limb amputations and prosthetics. Legro et al’s study differs from this study as it uses “quality of life” as what can be called a dependent variable and the perception of the patient/user as an independent variable, which has been identified in the following three factors.

- Patient/users ability to perform various activities while using the prosthetic.
- Psychological effect of using a prosthetic.
- The social effect of living with a prosthetic.

Although comparisons can be drawn between this study and others due to the use of similar independent variables such a psychological issues, this study has been modified to sufficiently assess the issues of importance to the amputee. This chapter will therefore argue the importance of establishing the three above issues and the means by which assessment is to be achieved.
5.3 The Assessment of Issues of Importance to the Amputee

The assessment of issues of importance to the amputee is key to achieving a desirable level of patient/user satisfaction with their prosthetic and in turn establishing or re-establishing a sustainable and adequate quality of life.

Although this is the ultimate goal of any medical team the assessment and itemisation of issues of importance is extremely diverse and difficult. This is due to the differing perceptions of patients with various experiences, ages, amputation/prosthetic history. As a result there are significant differences in issues of importance reported by different patients.

The medical profession itself has differing opinions on how best to treat the patient dependent on their medical background. The prosthetists may have insight and solutions to issues of importance which are in contrast to those held by a psychologist, whose experience is built up from the reported reactions and perceptions of his past client/patients.

Additionally issues reported by the patient may be ignored as satisfaction is often seen as the result of the prosthetic performing the intended functions that it was designed to do, which is intrinsically the facilitation of the patient with the ability to walk and stand. Although this is true as illustrated in chapters two and three there is a great deal more to the patient being truly satisfied with their prosthetic.
Often established criteria by which issues of importance are assessed and satisfaction with the prosthetic is gauged are inadequate or difficult to formulate due to the individual needs, demands and perceptions expressed by the patient, which again is dependent on the patient's characteristics both physically and psychologically.

In an attempt to itemise these extremely individualistic perception-based issues which impact daily activities and prosthetic satisfaction many researchers within the field have attempted to suggest psychological causes and potential resultant disorders. Thompson (1992) proposes a criteria for body-image disorder "if the symptoms are distressing to the individual to the point of functional interference in daily activities," a body-image disorder may be present. In reference to this it can postulated that any interference to daily activities can result in dissatisfaction with not only their situation as a person with a physical disability but dissatisfaction with the prosthetics themselves. Thompson (1992) summarises the criteria for body-image disorder:

a. A continual dissatisfaction with an aspect of one's physical appearance that impairs involvement in social activities or vocational functioning.

b. Presence of two of the following symptoms:

(i) Affective anxiety on a daily basis, which becomes aggravated by social situations.

(ii) Cognitive distortions of dissatisfaction with body area.

(iii) Behavioural avoidance of circumstances when one's physical appearance can be evaluated by self or by others.

(iv) Perceived body size to be at least 25 percent larger than actual.
Shontz, (1974) on the subject of physically disabled psychology suggests that the levels and functions of body experience are integrated. He describes the normal functions of the human body in the following way.

1. Acting as a sensory register, the body realises incoming sensation, interprets and integrates the information and files the data for retention.

2. In response to stimuli, the body can respond as an instrument for action. This action can be as simple as a primitive reflex or as involved as jumping out of the way of an oncoming vehicle.

3. Humans come equipped with a source of drives adequate to assist survival. Additional needs are generated by learning. Bodily drives are usually automatic, such as hunger or thirst, whereas social drives are learnt.

4. As a stimulus to the self, the body serves as a reference for self-identity. The body is heavily endowed with significance to be evaluated in relation to others.

5. Because the body self is greatly influenced by social values, it acts as a stimulus to others. As a result, the response from others can cause an individual to evaluate him – or herself in those terms. Physical appearance is a definite social stimulus.

6. The body offers a private world for the personal self to exist. Shielded by ones physical boundaries, as place of private expression is available. Unique and impervious to others.

7. Besides being a protective shell, the body is a vehicle or an expressive instrument for individual expression. Countless and elaborate expressions are encountered daily in body language seen between interacting individuals.
Shontz (1975) continues to compare the human body structure system to a corporation, suggesting that “integration is mandatory if a person is to prevail and individuate”. Body experience and personality operate together and therefore it is acceptable to suggest that any reduction or interference to normal daily activities as a result of decreased mobility or other physical impairment can again increase dissatisfaction with the prosthetic and their situation.

In support of these findings Fishman (1959) determined that the amputee’s perception of his or her disability is of more impact on rehabilitation than that of the extent of the disability. He states “a number of very specific psychological, social and physiological human needs are thwarted when one becomes physically handicapped as a result of amputation... The method of adjusting psychologically to an amputation is primarily a function of the preamputation personality and psychological background of the person.” Fishman further suggests that in time the amputation and the prosthesis are not the main focus of the amputee who becomes successfully rehabilitated, but identifies the seven human needs common to amputees.

- Physical function with a prosthesis.
- Visual and auditory considerations for the prosthesis.
- Comfort of the prosthesis.
- Energy expenditure in using the prosthesis.
- Achievement in various activities with use of a prosthesis.
- Economic security.
- Status and respect of one's peers.
Using these seven common needs as specified by amputees (Fishman 1959) it is possible to recognise issues of importance to the amputee which may affect their satisfaction with their prosthetic and in turn their quality of life. As a result of Fishman's (1959) identified amputee needs and collaborative literature it has been possible to further focus the variables, concentrating the issues of importance to the amputee/prosthetics user into four main fields, namely, fit, comfort, practicality and psychological. These four variables will be used as an adequate guide and measure of the representation of issues of importance to the amputee and prosthetic satisfaction.

5.4 Indicators of Amputee Satisfaction

The four variables, fit, comfort, practicality and psychology although not a total representation of the issues of importance to the amputee, they represent a satisfactory indicator of overall amputee satisfaction with regards to specified issues of importance.

These four variables can be considered as significant indicators to the measurement of the issues of importance and prosthetic satisfaction due to the following points. They also indicate the manner by which they have been investigated in other studies. Accounts of amputee satisfaction within the literature generally expresses the four variables of, fit, comfort, practicality and their effect on the patients psyche as important issues affecting quality of life although a unique concept for each patient. The following points illustrate each variable.
(i) Fit

Patient satisfaction as specified by the identifier of prosthetic fit has been connected with the efficiency of the prosthetics user's mobility. By this it is suggested by Piro (2000) that “a highly functional foot cannot work well for a below knee amputee with an ill fitting prosthetic socket”. He also suggests that in-addition to the demands for less weight, higher stability and greater durability of the new materials that there has also been an increase in the demands of the individual for several improvements including better prosthetic fit. He further reinforces the importance of prosthetic fit “above all the different requirements, expectations and handicaps, there is this one principal: the socket has to fit” (Piro, 2000).

(ii) Comfort

The comfort of the prosthetic is of importance to the amputee based on several publications including Covey et al, (2000), in which they describes the comparison of mechanical properties and friction levels of various prosthetic liner tissues. Covey et al go on to describe sub-variables all of which they found to impact on patient/prosthetic comfort including liner material energy absorption and impact and the displacement of the residual limb in response to differing liner materials.

(iii) Practicality

The practicality of wearing the prosthetic is an issue of importance to the amputee in many respects. Issues that can be encompassed by the term practicality are infinite and can not practically be examined with any depth
within the constraints of many studies as practicality issues are wholly dependent upon user/amputee response and perception. However many researchers have attempted to reach a level of understanding which can be grouped within the context of practicality with literature examining issues ranging from prosthetic wear duration, donning and doffing of the limb, ease of strap application if any and perspiration level (Peethambaran, 2000). Further studies have identified differing issues within practicality such as Legro et al, (1999) who identified the avoidance of blisters and sores, undesirable smelling prosthetic, weight of the prosthetic and avoidance of the prosthetic damaging clothing.

(iv) Psychological

Psychological issues identified within the bounds of patient satisfaction, as reported by amputees are predominantly linked to the patient developing a positive body image, with failure to do so resulting in the possible manifestation of depression, anxiety and reduced self esteem (Henker, 1979; and Kashani, 1983). Such psychological imbalances including depression are evoked due to physical, social and emotional adjustments, with many older amputees never becoming able to walk with a prosthesis (Williamson, 1995). The identification of factors that lead to the construction of psychological barriers for the amputee can drastically reduce the susceptibility of those predisposed to adapt poorly. Such factors are all impacted by the disabled persons functional levels such as motion and general physical ability, with reduced prosthetic use, adversely affecting issues such as household income, social resources and high public consciousness. Williamson also suggests that

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the amputee suffers from feelings of vulnerability, being less able to defend themselves than those with greater mobility. Inherently this is dependent upon the amputee's use of the prosthetic, with the implication being that satisfaction with their prosthetic is a combination of the other three variables under investigation during this study, fit, comfort, and practicality.

5.5 Patient Satisfaction Defined.

Patient satisfaction with regards all areas of the prosthetics field including the issues of importance to the amputee as specified by Fishman (1959), has increasingly become a major outcome variable attracting the attention of rehabilitation professionals (Abramowitz, et al 1987). This interest is presumably as a result of the mounting evidence that links patient satisfaction to a variety of health outcomes and health care factors, with patient satisfaction being associated with the adherence to medical protocol or rehabilitation regiments, and the understanding of and retention of medical information. Due to these factors and economic variables, policy makers within the medical profession have taken particular interest in the assessment of patient satisfaction and its impact on health care costs and clinical outcomes.

As a theoretically constructed concept, patient satisfaction has been interpreted in many ways. Some investigators have perceived it as an issue within a construct with many components, suggesting that patients do not identify satisfaction as a single element within the context of health care, but gauge satisfaction as part of the whole service (Ben-Sira, 1976; Hays, 1988). Other investigators have described patient
satisfaction as not being identified singularly but being formed from a multiple perspective (Ware et al, 1983).

The increasing interest in patient satisfaction has even been brought about the mathematical modelling of the concept to construct an empirical patient satisfaction framework (Marshall et al, 1993). Identified by two terms patient satisfaction can be called discrete or global, discrete referring to the individual distinct specifications of satisfaction and global referring to the overall or combined issues that create patient satisfaction. Marshall and colleagues concluded that patient satisfaction with health care was not one or the other but a simultaneous incorporation of both discrete and global domains that could be assessed by using each area. Additionally they propose that although global satisfaction may be interesting in some context, discrete, domain specific satisfaction may be differently predictive especially regarding predictors of patient behaviour and health outcomes (Marshall GN et al, 1993).

Patient satisfaction measurements with reference to the greater population but especially children with limb deficiency with their unique prosthetic requirements may particularly benefit from the discrete specific dimensions of satisfaction assessment. Although little research has been undertaken in relation to this particular population, previous studies have presented a relationship between several satisfaction-like variables and prosthetics used for amputee children, which again can be used for the larger community. For example prosthetics comfort and repair needs have been associated with the duration that the child wears its prosthetics (Boyle et al, 1982; Tebbi et al; 1989), such relationships highlight the importance of patient
satisfaction and its effect on health outcomes including psychological wellbeing (Williamson, 1995).

Children and adults alike who are dissatisfied with their prosthetic often limit their wearing due to identified issues of comfort, performance or cosmetic appearance, as a result experiencing less independence and an increased level of disability than would otherwise the case. Indeed the amputee may even decide not to wear the prosthetic at all, as Jess Williams testifies. Born with the absence of both arms her case is not unique having rejected her prosthetics at an early age, “when I was a kid, they kept trying to fit me with an artificial arm. I never could get used to them, though, and it took me a while to decide that I didn’t want to be fixed, because I wasn’t broken” (Williams, 1989). From this statement it can be concluded that satisfaction in connection with psychological outlook impacts greatly on prosthetic acceptance, need and use. In support of this, other prosthetic users experience similar issues and feelings of dissatisfaction with their prosthetics such as Jan Garret, born with no arms at all and partial thighs on both sides. She comments “As with my arms, I decided that my legs actually lessened my level of independence, in that I could not make unassisted transfers, and I could not move freely within my wheelchair seat”, she goes on to say “Prosthetics are Tools. If they are of use to the person using them, they should absolutely be used” (Garett, 1997).

Testimonies such as these illustrate patient satisfaction, indicating the necessity to re-address and improve health outcomes through the identified issues of importance to the amputee such as functional status and quality of life.
Prosthetic satisfaction therefore can only be assessed following the installation of accurate outcome measurement perimeters. Many studies have assessed patient satisfaction in differing ways, with the measurement construct primarily based on the medical professions own identification criteria, such as function, fit, appearance and service (Pruitt et al, 1997). Therefore inadvertently negating issues as expressed by the amputee prosthetics user, as stated by Fishman (1959) and discussed earlier in section 5.3.

Alternatively other studies have attempted to identify the issues affecting patient satisfaction in an organisational respect, suggesting satisfaction is based on the quality of service and the impact of medical decisions made by the orthotic and prosthetic clinicians (Gwyer, 1995; Polliack et al, 1997).

Ultimately, most clinicians agree that by whichever means, surgical, prosthetic, rehabilitation or clinical decision based, there are two major goals. The first to enable the person to have limb function and the second, the facilitation of the disabled persons interaction with their social environment and the restoration or introduction to social contact. These basic intentions are again dependent on the satisfaction of the patient with their situation including disability and prosthetic, with instances of reintegration to work and other social activities being reported as inaccessible to people following lower limb amputation (Niessen and Newman, 1992; Jones et al, 1993; Walker et al, 1994; Fairhurst, 1994). In addition decreased time in leisure activities and early retirement reduce quality of life in some instances (Trundel et al, 1984; Niemi et al, 1988).
The diversity of the studies within the literature intended to identify the core elements relating to patients satisfaction illustrate the continued assessment and improvement of the effectiveness of the prosthetic and the prosthetics service as a whole. However, there are limitations within this literature, as the service and prosthetics are improving through technical development and research based primarily in the workshop or laboratory, they still neglect the views and requirements of the patient. Therefore not actually addressing or satisfying the issues of importance to the amputee/prosthetics user.

The literature also spotlights that the objectives or requirements of the user are numerous and vary substantially depending on user factors such as age, gender, amputation level and environment. Such factors go towards supplementing satisfaction levels perceived by the amputee prosthetics user regarding their prosthetic and the type of service available to them. These factors also establish the boundaries by which the prosthetic is designed and which type of prosthetic is prescribed to the person, which again may affect satisfaction outcomes.

This concept of satisfaction, which impacts all areas of amputee/users quality of life, is based on their full expectations or desires being adequately fulfilled. With issues of importance dealt with in a manner that addresses expectations, therefore, putting an end to unfulfilled needs or requirements, suggested as issues of importance to the amputee by Fishman (1959).
5.6 Evaluation Criteria

As stated earlier factors such as age, gender, amputation level and environment can potentially be used as criteria by which to evaluate general satisfaction outcomes in connection to prosthetic usage and suitability, thus establishing design boundaries by which prescription can be identified. The variables of prosthetic satisfaction and suitability within the four factors of age, gender, amputation level and environment are extremely subjective, with different people describing differing criteria of importance individual to themselves. Therefore the following are a some of the factors influencing the patient’s satisfaction with the main variables of fit, comfort, practicality and psychology, however, these are a sample rather than a definitive list.

(a) Age: - Walking training, physical exertion, physical strength, walking training, perseverance, concurrent illness/disabilities, stamina, general mobility, psychological adjustment, psychological makeup, dermatological issues, wound healing, balance, age related causation, flexibility, physical adjustment, etc.

(b) Gender: - Body image, relationship building (sexual, friendship, family), societal role (hunter, provider, homemaker), reproduction, parenthood (mother/father), identity, etc.

(c) Amputation Level: - Structure of amputation, configuration of amputation, severity, causation, prosthetic type, amputation problems, cosmetic appearance (clothing/appearance), body symmetry, mobility, strength, stamina, flexibility,
rehabilitation, adaptation to prosthetic, adaptation to disability, additional assistive devices.

(d) Environmental: - Social interaction, access to environment (libraries, schools, social areas), education, workplace, effect social handicapping, societies reaction, inability to conform, discrimination, ability to work.

5.7 Quality of Service and Patient Satisfaction Assessment

Prosthetic satisfaction and quality of service can be encapsulated in the term “quality control”. This holistic term, allows for the evaluation of the core variables of satisfaction within the field of prosthetics and healthcare field at large, comprised in three areas. Firstly, prosthetic component and assembly evaluation, secondly, outcome measurement, which refers to the clinical evaluation of prosthetic suitability in addressing patient profiled needs and thirdly patient-reported satisfaction levels.

The theory of statistical based quality control was developed in 1929 by Dr. Walter Shewart of the Bell Telephones Laboratories (Shewart, 1931). A theory that was later exported to Japan in 1950 by Dr. W. Edwards Deming, forming the structure for a series of lectures on the science of statistical quality, or statistical process control (SPC). Which he, together with Dr. Shewart and Dr. Joseph Juran had promoted in the United States during the early 40s through the American Society for Quality Control (Shewart, 1939; Deming, 1951).
SPC is a philosophy stating that the production of goods comprises a series of processes and that it is possible to detect and eliminate negative variables, at any stage, that affect the overall manufacturing process (Shainin and Shainin, 1988). While their work was not accepted in the United States at the time, the Japanese manufacturing sector embraced it and SPC evolved significantly becoming what is known today as “total quality management” (TQM).

The Japanese manufacturing sectors adoption of SPC and Deming’s 14 points of TQM resulted in a significant improvement in the manufacturing process, affecting a sizeable contribution to Japan’s economic success. As a consequence, other parts of the world and most notably the United States as the birthplace of TQM delayed the adoption of the technique so as to assess the mechanisms for goods production. The overall result has meant the foundation of new manufacturing techniques that have led to the direct improvement of issues such as productivity, quality and competitive industrial positioning.

Today SPC/TQM are used in all areas of commerce both governmental and corporate the world over, however such philosophies have been adopted slowly within the United Kingdom’s, National Health Service, possibly as a result of the trepidation on behalf of a reluctant practitioner workforce who have historically revealed a cultural distaste of direct leadership (Irvine, 1996).

Alternatively the speed by which SPC/TQM have been adopted within the medical profession at large may be due to more simplistic factors, such as the difficulties held
within the assessment of the constituent, namely people, rather than for example, the static variables associated with machinery and products.

The advantages of using such SPC/TQM philosophies is in its strength as a cost-affect analysis tool, proven to be yield the most benefit to the population through the effective use of cost allocation within current restrictions and the measurement of desirable outcomes. The objective being to improve prosthetics administration and healthcare quality in general, producing devices and services that are functional, reliable, well-fitting and effective in improving conditions for the person with disabilities.

Satisfaction in relation to the three previously identified areas of health care evaluation and quality control will now be discussed.

5.8 Prosthetic Component and Assembly Evaluation

In the past limited attention has been paid to quality considerations in prosthetics and orthotics services. Indeed it is only comparatively recently that minimum standards of quality have been established for the production of prosthetics within industrialised countries (WHO, 1999).

The United Kingdom, Germany and Japan alike have long had a history of quality regulation set by purchasing authorities, which were in the main government agencies. The United Kingdom in particular has long established manufacturing and
fitting procedures, conducted in dedicated limb fitting centres, executed by educated professionals thus guaranteeing the devices safety and fabrication standards.

This limb fitting centre based quality control was preceded by the testing of new designs by government bodies, under established structural assessment, including the following and other analysis, techniques (Shorter, 1988).

- Testing as a Design Tool, which incorporates stress analysis of complex structures, e.g. stress pattern analysis by measurement of thermal emission (SPATE).
- Materials testing, including composite and bond testing.
- Prototype Equipment Testing to aid design refinement of components.
- Type Approvals Testing, so as to comply with national and international regulatory bodies such as the European Medical Devices Directive MDD/42/93, the European standard EN 12523 and British Standards.
- Field Trials, to supplement laboratory testing through small scale sample group testing. Environment testing, including accelerated wear testing, corrosion effect, etc.
- Quality assurance testing. In house testing of randomly selected components. (Shorter, 1988)

Laboratory based quality control is accompanied by a well established fault reporting procedures, which continuously monitors the performance of the product in the field, with adverse reactions being assessed and if necessary acted upon. A process that has
positively affected the quality, outcomes, efficiency and refinement of all products
distributed within the United Kingdom.

This rigorous testing and monitoring of prosthetics devices within the United
Kingdom was augmented in 1993 by the European Communities harmonisation of
European law, economic and social relationships, with the introduction of the
European Medical Devices Directive MDD/42/93. This is a regulatory command
governing Prosthetics and Orthotics as well as other medical device industries. Which
in addition to the minimum standards of European standard EN 12523, intends to
define objectives and ensure the safety of the medical device and protect the rights of
the user/amputee (Zahedi, 2000; Boenick, 2000).

These laws and manufacturing standards have facilitated the implementation of
structured quality control measures to be introduced across Europe and much of the
industrial world. With new directives generating the same quality initiatives within
the developing world, leading to the invention of revolutionary new ways of thinking
and technical advancement based upon local social, economic and cultural diversity.
One such example of the emphasis placed upon quality control and improvement of
prosthetics within the developing world is represented by the revolutionary Jupitar
foot (Kurzman, 2000).

5.9 Outcome Measurement.

The term outcome measurement was coined in the 1970s by Paul M. Ellwood, a
notable American healthcare professional, “In medicine... our unifying goal is the
good of the patient. To support this philosophy, I propose that we adopt a technology for collaborative action. Let's label this technology "outcomes measurement." (White and Gaillour, 2000).

Today "outcomes measurement" and its comparable philosophies of quality health care have been implemented in much of the industrial world. While quality measurement is the essence of "outcomes management" its importance lies within the ability to impact the result through the identification and finite alteration of care delivery. This delivers established expectable and desirable results from all parties involved in the care and rehabilitation of the patient. The quality of outcomes management and the overall outcome is therefore forged upon the collaboration and active involvement at all stages of the clinicians, government bodies and patients.

Outcomes measurement although a modern phrase can trace its origins to the mid 1800’s Victorian England and the founder of modern nursing, Florence Nightingale, who began her crusade to improve post-surgical mortality during the Crimean War, later expanding her investigation into the unpredictability of surgical results within British hospitals. This methodological approach to the quality of outcome measure, uniformity of outcome and comparison of outcome, can be recognized as one of the earliest demonstrations of quality control within medical health care.

Today these rudimentary health care methodologies have been augmented by the addition of patient information including outcomes measures being assessed by the medical establishment who conducted the treatment. This is especially true of limb fitting centre protocols within the British isles, who conduct follow up quality control
assessments. These follow-up assessments consist of patients being monitored as to the successfulness of their treatment as defined by the patient and if the patient found the treatment lacking, based upon this information.

5.10 Option Assessment

Patient satisfaction and TQM methodologies within the medical profession is based upon initial treatment options considered in order to deliver the highest quality of life to the patient.

In contrast to the manufacturing sector, which can be thought of as the pioneer of SPC/TQM methodologies, the medical profession at large is limited by the very nature of the field, dealing with the Human being. This restriction of theoretical and physical experimentation, limits treatment options in many cases to past experience and success of both patient and practitioner. This is opposed to the manufacturing sector where products and services can be tested to destruction with few if any detrimental results.

In the case of the amputee the assessment of treatment options for optimum patient results and satisfaction starts long before the prescription and fitment of the prosthetic. With many factors influencing the prescription options available to the clinical team, including, cause of amputation such as, illness, accident or congenital disorder, patient age, patient sex, health level, amputation level, skin viability, blood flow, expected rehabilitation speed and patient support network (Young et al, 1978).
The advantage of using such criteria within a multidisciplinary team based environment is aimed at a more accurate forecast of outcomes and patient rehabilitation thus improving patient quality of life, satisfaction and reducing treatment costs.

These criteria based decisions made prior to and during the surgical stage greatly impact all areas of rehabilitation. With experienced surgical teams obtaining good results (Romano and Burgess, 1971; Robinson, 1972; Burges and Matsen, 1981) which facilitates the ease by which prosthetists can fit prosthetics, physiotherapists can assist the patient and the patient can retain or achieve a good quality of life.

However this criteria based modelling of outcomes and therefore options has the potential if regimentally adhered to, of restricting advancement within the field or even limiting the opportunities for a tailor-made service. This is especially true of the limb fitting service, which although it uses a broad range of criteria by which to establish the highest levels of quality is in danger of ignoring the individually specific needs of the patient. This can be illustrated by the use of pylons as temporary prosthetics following surgery, a technique that is increasingly becoming questioned and rejected but is still thought of by many as a necessary rehabilitation technique and stage.

5.11 Studies of Patient Prosthetic Satisfaction.

Measurement of patient satisfaction can be achieved by the appraised of a wide range of characteristics particular to each individual but commonly shared amongst the
focus group. Characteristics could include patient activities during the time they wear the prosthetics, patient attitudes and/or their reactions to their prosthetics and disability, the limitations of the prosthetic and/or fitting process and aspects of the prosthetic that they feel could be improved upon. Within these broad areas existing studies have ranged factors affecting the use of prosthetic services (Nielsen et al, 1989) to the relationship between performance, satisfaction and well being (Peethambaran A, 2000).

In terms of patient satisfaction few studies have been published that investigate the role of prosthetics information and or patient prosthetists communication with respect to its affect on patient satisfaction. However many limb fitting centers monitor patient satisfaction internally through routine. Which in terms of this study may prove to be issues regarding communication and its affect on general patient prosthetic satisfaction.

5.12 User Aim’s and Demands - Definitions.

Satisfaction can be said to be based upon how well the needs and preferences of the people who are in direct contact with the design are met. Or as Peethambaran (2000) defines this as “Satisfaction is defined as the physical and mental achievement of the functional goal with the orthotic system”.

However satisfaction within the field of orthotics must be associated with two other user requirements, performance and wellbeing. Which are clearly defined by Peethambaran (2000) “The relationship between performance satisfaction, and well
being for patients using Anterior and Posterior design knee-ankle-foot-orthosis” and he suggests that, “Performance is defined as the ability of the participant to accomplish the task to be performed within the ergonomic aspects of the orthosis” and that, “well being is defined as the state of being comfortable mentally and physically within the orthotic system”.

It is difficult to identify the needs of the user to any finite degree beyond the obvious patient disability and functional level. Satisfaction, however, must be associated with other user factors, including, psychological state through differing body image (Kenedi, 1988), social group and increasingly cultural background (Kaphingst and Heim, 1988). Through the careful evaluation of these and many more factors, an attempt can be made to establish an accurate representation of the patient/user and their requirements for the prosthesis. However this is a task that is not easily executed, as most user requirements are perception based, therefore fluid in their interpretation and communication, with one day not necessarily being the same as the next.

As a result of these interpretation based patient/user evaluations a number of different definitions and criteria have been suggested for user satisfaction and healthcare outcomes measurement, primarily relating to the psychological and physical requirements of the user. The intent of these categorized definitions has been to improve patient quality of life. However, this has not necessarily been achieved within these criteria. Due to predominant concerns regarding medically defined achievable goals as indicated by Shontz (1974,1975) and not the needs and requirements as expressed by the patient/user.
As a consequence patient/user requirements indicated by the literature review is not precise and have not been specifically stated by the user group namely the patient/users. Meier (1999) suggests that “The person who experiences an amputation of the arm or leg today should expect that the combination of contemporary prosthetic technology and rehabilitation will lead to a more satisfying quality of life than that experienced by a similar amputee ten years ago”. He elaborates “The best outcomes however, are achieved with a combination of the most appropriate technology together with an integrated system of rehabilitation with the amputee as the focus of the treatment plan.”.

Meier (1999) through the realisation of the importance of a user focused treatment and to illustrate to the patient their highest achievable level of functionality, has identified twenty one criteria that following rehabilitation treatment may enhance patient outcomes in relation to their individual level of function and understanding of their disability.

1. Ambulation with prosthesis on all surfaces
2. No gait aids
3. Independence in donning and doffing prosthesis
4. Standing up to two continuous hours
5. Walking up to two continuous hours
6. Gets up from kneeling
7. Returns to recreational activities (hunting, fishing, golfing, jogging, skiing), if performed prior to amputation
8. Return to previous work
9. Comfortable with falling techniques
10. Perform cardiovascular conditioning program safely
11. Drives
12. Shops
13. Performs housework, gardening, home maintenance
15. Knows how to purchase correct footwear
16. Can inspect skin and nails of remaining foot
17. Ascends and descends stairs step over step
18. Can run (if patient desires and has adequate cardiopulmonary reserve)
19. Return of normal sleep pattern
20. Regained emotional well being (absence of depression or anxiety)
21. No significant pain is present in the phantom or residual limb

Contrary to Meier’s criteria for ideal functional level, Maslow (1970) views human needs as an ever changing process and not a fixed set of requirements that can be attributed to all people, he suggests that complete satisfaction cannot be achieved due to their changing nature. When one need is satisfied another emerges, he suggests that this is also true of self esteem and belonging, among other psychological requirements.

5.13 User Attitudes Criteria.

Patient welfare and the acquisition of quality of life is of paramount importance to any limb fitting centre and medical team. As a result research has increased over the last
20 years, to deliver optimum levels and standards of care to the patient, who to many within the medical fraternity are now called consumers. However this continued research and service improvement must be led by questioning the core variables held within the concept of patient or consumer satisfaction. This, therefore, leads to variable quantification and definition so as to facilitate the measurement of the deliverables regarding prosthesis and quality of life.

Although patient satisfaction is a subjective concept dependent on ever changing criteria by which the consumers quantify their quality of life and prosthesis. It is important to establish what the consumer thinks about their prosthesis, over and beyond any advantage or disadvantage held by the prescribed prosthesis. This is to discover to what extent the prosthesis is delivering solutions to given problems or indeed creating new, unpredicted ones. By this means it is possible to establish satisfaction levels and identify issues of importance to the consumer.

Various studies have used the concept of user satisfaction, under different terminology such as user attitude, outcomes measurement, patient requirements, patient experience, patient perception, patient functional levels, life satisfaction, quality of life, service quality assessment.

The measurement of such factors influencing user satisfaction however can come under scrutiny, with criticism being expressed in the several ways. :-

i. Amputees are normally intelligent people, who find themselves in a frightening situation. Frightening, because they are often not told the facts, good or bad, that they have to face (Dixon, 1988).
11. The consumer has the right to be informed so that his/her fears from ignorance are reduced in these conversations, in ordinary language, and not larded with the jargon of the so called professionals (Dixon, 1988).

This response indicates that the patient/consumer in many cases is so frightened or uninformed regarding their situation that they may not be able to answer questioning regarding satisfaction in a truthful or accurate manner.

It also goes to indicate that the amputee in general may be ill-informed as to the process of limb fitting in general and the terminology that may be used. Therefore inadvertently expressing irrelevant issues or being unable to express issues of greater importance.

It is also true that variation occurs with regards to personal interpretation of factors, indeed the variable of pain in relation to satisfaction has been identified as subjective, this is best indicated by a study conducted in San Francisco Bay in 1988 which suggested that amputees experience some level of pain and had not reported their concerns (Hoaglund, and Jergesen et al, 1983).

Irrespective of these potential criticisms no alternatives are available that navigate this interpretation based assessment method, but the basic requirements of the prosthetic consumer will not drastically vary from those illustrated within the literature. This is due to the majority of the amputees requiring a similar level of satisfaction and quality of life, depending on their situation. However the literature, interviews and preliminary field studies have highlighted that not all of the consumers needs have
been satisfactorily addressed. Therefore the amputee consumers requirements with respect to the needs and demands of the prosthetic will be now be determined in section 5.14.

5.14 Prosthesis Consumer Requirements.

The following reported prosthetic customer requirements as described within the literature and interviews are a sample from the enumerate responses and are aimed at demonstrating patient needs not only from the prosthetic its self, but from the limb fitting service and general health service.

a. To have easy access to the necessary technical and medical facilities.

b. To have access to medical practitioners with the necessary technical expertise

c. To be facilitated with necessary information regarding their, disability, prosthesis and fitting process.

d. To be medically assessed with their needs and requirements of primary concern.

e. To be able to ask relevant questions regarding their predicament.

f. To be included in all aspects of the decision making process.

g. To be able to communicate with the limb fitting team at all levels without jargon.

h. To be able to return to as near normal physical activities as soon as possible.

i. To receive equipment that is suitable in fulfilling their needs.

j. To receive equipment that is of a high quality, in durability, technology and build.

k. To receive equipment that is purposely fitted to the individual.
1. To be informed how to best care for your stump and prosthesis.

m. To be equipped with a prosthesis that is of a good level of cosmetic realism.

n. To be equipped with a prosthesis that is a comfortable weight for prolonged use.

o. Not look that they have a prosthetic when walking, standing or seated.

p. To be able to don and doff the prosthesis unassisted.

q. Not to be in pain while wearing the prosthesis.

r. To have a high level of comfort while wearing the prosthesis.

s. Not to be restricted in any movement while wearing the prosthesis.

t. Not to be restricted in the activities available while wearing the prosthesis.

u. To receive a level of medical care and prosthesis that reassures and increased a sense of security.

v. To be treated as a consumer rather than a patient

5.15 Practitioner Requirements

Although the Practitioner is not the focus of this study it is important to identify some of the issues practitioners experience when dealing with an amputee. Increasingly within the literature, there has been a drive to refer to the patient as a consumer, evoking a mentality that is based on deliverable needs.

However this has increasingly brought about the questioning of protocol when attempting to deliver satisfactory levels of care and quality. Studies have demonstrated that effective communication is associated with increased
patient/consumer satisfaction, treatment compliance and improved health outcomes (Boreham and Gibson, 1978; Ross and Duff, 1982).

An important aspect of communication is the nomenclature or terminology used within the medical establishment, suggesting that although there must be a specific means of defining and describing medical syndromes and processes, it should be confined in its use to appropriate communication between medical practitioners. Not as is often the case, confusing or even frightening the consumer with the use of unnecessary jargon. Therefore some prosthetists communicate with the patient/consumer in a manner that is more widely understood, using ordinary language, to explain their investigations.

However it is expected that the patient consumer will learn some terminology through reading about their disability and listening to fellow amputees and other staff within the limb centre, thus improving descriptions of discomfort and easing the quick and speedy rectification of problems (Dixon, 1988).

Finally practitioners increasingly express concern over the inflated unrealistic expectations held by amputees, who sometimes have the idealized images of robotic, technologically advanced prosthetics instantly allowing them to fully regain mobility. Of course this is not the case with the latest, most expensive technologies not necessarily enhancing prosthetic outcomes. Amputees must be trained to achieve the best functional outcomes with the available technology.
The amputee, physician, prosthetists and therapists need to identify and target the highest level of functional outcome possible for that patient and design an individual rehabilitation program. It is also true that where other concomitant illnesses are present the rehabilitation team must address these issues in parallel in order to facilitate the user with the maximum benefit from their prosthetic (Meier, 1999).

5.16 Problems in the Identification of User Requirements.

Within this study several problems can be distinguished with the identification of user requirements within the concept of patient/user satisfaction. As illustrated earlier patient requirements differ, therefore, creating an extremely subjective view of the needs and demands that are expressed upon a prosthesis and limb fitting service in general. This subjective view of needs although based upon a plethora of differing criteria is predominantly as a result of three factors, the sex, age and amputation level of the patient.

Additionally many amputees tend to receive their surgery in the later stages of life, as a result of dysvascularity (NASDAB, 1999) therefore it is possible to speculate that they may have no experience by which to draw comparison. This is expected to differ from a patient who has been an amputee for many years. Having built up a knowledge base and a rule for comparison between differing, prosthetists, prosthetics and limb fitting techniques. It is also true that the longer the time as an amputee the more able the user is at describing their problems and concerns in all aspects of the service.
Alternatively it may be the case that an amputee has only had one limb fitter since their amputation. Therefore having no experience of differing prosthetists who inevitably adopt their preferred methods and techniques by which they have had, in their eyes previous success. As a result the user again knows no better and has no knowledge of alternatives by which to criticize or gauge satisfaction. Additionally this restricts not only the user’s knowledge of their condition but also differing methods and approaches to treatments and problems.

5.17 A Model For Measuring Patient Satisfaction.

The concept of patient satisfaction emerges from the need to evaluate the intended deliverables which it is hoped are achieved by the prosthetic and limb fitting service in general, assessing the characteristics and variables which constitute patient quality of life. It is important to discern that these characteristics relate to the users satisfaction with the prosthetic and limb fitting service in use and not those factors which have been identified by the medical profession and which they deem to be important.

The intent of the prosthetic and limb fitting centres, is to provide as good a quality service and equipment levels as possible within the confines of patient/user abilities and unfortunately, costs. With the extent to which this is achieved being the evaluation of characteristics leading to clinical outcomes measurement and patient satisfaction.
Within the literature two primary issues have been identified for evaluation by the patient/users, concerning the prosthesis and associated medical practices and treatment, which have been expressed by the literature and preliminary field exercises.

The first, primary issue is an assessment of the degree of patient satisfaction with respects to the prosthesis and medical teams delivery of prosthetic, fit, comfort and practicality and their associated impact on psychological wellbeing, including their impact on achievable goals of quality of life. This is measured by direct questioning and the acquisition of data, pertaining to patterns of activities, such as donning and doffing of the limb, use of stump socks and frequency of limb replacement or maintenance.

The second primary issue for assessment is the extent by which the prosthesis and medical team facilitate the acquisition through treatment, equipment and rehabilitation of acceptable standards of quality of life for the prosthetic user/patient according to their maximum achievable outcomes. This is again mainly accomplished through questioning, but, also assessed through the overall assessment of answer quality and supplementary data gathering such as user education level, personal comment in connection to social exclusion such as education and work related issues and whether the user actively participates in social or leisure activities.

Although devising simple measures for these two issues is extremely difficult and complex, the use of similar lines of questioning and issue investigation, (Fishmans 1959) regarding user attitudes are a satisfactory indicator of both issues, especially if
user requirements and needs are clearly identified and defined. Once defined satisfaction measurement indicators can be established, making patient response comparison viable.

Ultimately this study will measure patient satisfaction, which will be broken down into primary indicators that will be again broken down into secondary sub-indicators, and again broken down further into tertiary sub-indicators.

5.18 Satisfaction Indicators

Many studies have tried to itemise issues of importance to the amputee, adopting various approaches and achieving differing levels of success. Through the careful assessment of these similar studies it was found that the approach of Fishman, (1959) was the most suitable by which to construct a measurement scale of patient satisfaction, to facilitate the itemisation of primary, secondary and tertiary indicators or variables. This was mainly due to its particularisation of seven factors with simplicity and clarity, which facilitated the elementary construction of the evaluation tool.

Fishmans (1959) aided this identification of factors through documentation of commonly held issues of interest/importance to all amputees. Highlighting that if satisfaction is not achieved within each of the itinerary, the amputee may experience psychological conflict, shifting behavioural patterns and dissatisfaction (Fishmans 1959).
Fishman's seven variables are each suitable in the evaluation of patient prosthesis satisfaction according to various amputee needs. These variables and their sub variables shall now be explained fully. Four variables relate to issues of fit, comfort, practicality and the psychology. One variable refers to issues of mobility and the other two variables both refer to issues of socio-economic status.

(a) Variable 1

Measures the users satisfaction with the functional physicality of their prosthetic which are indicative of daily use.

Sub-variable i.

Users satisfaction with the prosthesis during daily use consisting of prolonged activities which impact on issues such as, prosthesis wear time duration, walking distance, walking style and the number of times the user dons and doffs the limb during a normal day.

Sub-variable ii.

Users satisfaction with unrestricted movement, having unrestrained rotational movement of all limbs when undertaking general and sporting activities, the prosthetic suitability to facilitate natural movement, in terms of normal human locomotion.

Sub-variable iii.

User satisfaction in respect of prosthesis suitability, quality and manufacture, therefore limiting departmental effects on the residual limb such as soreness, rubbing or allergic reaction or other parts of the body such as lower back or other unaffected limbs.
Sub-variable iv.

Ease of prosthetic use with specific reference to practicality of use concerning the socket interface, the donning and doffing of the prosthetic, hygiene issues relating to perspiration and the use of socks.

(b) Variable 2

Measures users satisfaction and perception of cosmetic and auditory factors of the prosthesis.

Sub-variable i.

Measures the user perception and satisfaction with reference to the problems that arise from the cosmetic limitations of the prosthesis. In particular reference to activities that may led to the prosthesis becoming uncovered by clothes such as wearing sports clothing or in the case of a female amputee their requirement to wear skirts and other garments that may show their prosthetic.

Sub-variable ii.

Measurement of auditory aspects of the prosthesis, does the prosthesis make a mechanical or unnatural noise during movement, that would not normally be present with a non affected limb.

Sub-variable iii.

Refers to the visual manner by which the user walks. Whether their walking style is natural or robotic and therefore making their disability noticeable.
(c) Variable 3

Measures users perception concerning the comfort of the prosthesis.

Sub-variable i.

Relating to the users physical comfort while wearing the prosthesis, is the stump receiving enough support within the socket, and the stump receiving enough ventilation so as to reduce perspiration, thus facilitating prosthetic wear time.

Sub-variable ii.

Psychological impact of wearing a prosthesis, the manifestation of physical pain through amputation via phantom pain syndrome. Also psychological comfort can relate to the patient users mental adjustment to their disability and inherently their life as a disabled person.

(d) Variable 4

Measurement of energy expenditure while using a prosthesis during every day activities and more rigorous movement.

Sub-variable i.

Measurement of issues relating to prosthetic weight considerations, as the weight of the prosthesis is often more than that of the original limb.

Sub-variable ii.

Measurement of stamina indicators, such as social participation, activity characteristics and physical limitations. Identified through patient/users energy expenditure levels often being two to three times that of a normal person undertaking in the same activities, thus increases fatigue and participate ability.
(e) Variable 5

Measurement of achievement in various activities with the prosthesis includes, sporting, recreational and social.

Sub-variable i.

Measurement of perceived personal success in various activities with the prosthesis, such as educational progression, sporting or recreational pastimes and more personal activities such as relationships and friends.

(f) Variable 6

Measures basic economic stability through several sub variables

Sub-variable i.

Measures educational level suggesting the degree by which respondents disabilities have limited or hampered access to education and inherently how this may have impacted on occupation and or income.

Sub-variable ii.

Measures occupation and income, suggesting the degree to which the disability has negatively impacted the respondents life and career progression.
(g) Variable 7

Measures the status and respect of one's peers during all areas of daily activities.

Sub-variable i.

Primarily indicated by education, occupation and income factors this variable leads to the suggested level of social status especially when used in addition to information regarding pastimes, which can be clearly defined as social or singular activities.

Sub-variable ii.

Measures the level of assistance that the prosthetics user requires in order to participate in everyday activities. This is primarily suggested by the amount of reported assistance required by the user in donning and doffing their prosthesis. But, also indicated by the number of times they remove their limb in a given day, the duration they are able to walk, and the number of continuous hours they wear the limb for.

5.19 Conclusion - Issues of Importance to the Amputee with Regards to Prosthetic Satisfaction

The aim of this chapter is to propose measurement factors by which patient satisfaction with reference to reported issues of importance can be evaluated. It has been argued that this is difficult to do but through the use of other studies in the field the easy construction of variables of indication that could be validated.

Additionally it was necessary to investigate the issue of satisfaction, outcomes measurement and indeed quality, all of which are issues continuously assessed and
addressed within the health care service sector and required by the patient user. Due to patient satisfaction with the prosthesis being the main avenue of investigation their needs and requirements were assessed so as to identify the requirements delivered by the prosthesis.

The model formulated from the literature included seven main variables for indication and other sub-variables. Which could be classified into three main categories.

- The four issues relating of prosthesis fit, comfort, practicality and the psychological impact of the prosthesis on the attitudes and perceptions of the user.
- Relating to user mobility.
- Relating to the socio-economic status and social interaction.

Using these categories a simple model of measurement could be created, concentrating on user satisfaction with their prosthetic and quality of life through the degree by which the seven variables had been achievement and objectives acquired. This also leads to the indication of other potential factors which could impact on patient satisfaction.
6.1 Introduction

The aim of this chapter is to explain the reasons behind the research methodology adopted. Additionally explaining the use of previous studies in the prosthetics field such as, Kyberd et al (1998), Nicholas et al (1993), Pruitt, (1997) and The National Health Services in Scotland, Information & Statistics Division (1999), used as tools for comparison and identification of valid research techniques, informing the research approach.

To ensure study focus the research area was restricted to the use of artificial legs, therefore concentrating on issues that would be of direct interest and effect to the lower limb amputee.

The Identified techniques consisted of two research tools. Firstly, interviews both structured and unstructured. Presented solely to patients matching the identified criteria, being the users of lower limb prosthetics of any description and of specified age, being eighteen or over as instructed by hospital ethical guidelines, with the secondary research tool consisting of a prosthetics user/amputee based questionnaire.

Both tools were found to be the most satisfactory means of gathering data regarding the variables under investigation namely fit, comfort, practicality and psychological
impact. As anticipated the data gathered by these two methods encompassed a wide range of issues however the questionnaire was adopted as the primary means of theoretical data gathering used to indicate appropriateness of use. This chapter will ultimately illustrate how the final questionnaire used in this study was developed.

Following the initial unstructured research stage, consisting of a detailed and exhaustive literature review into all areas of interest within the field of prosthetics from the historical aspects of prosthetics, technological advances, disability issues, psychological impact of disability and surgical/amputation techniques, it was possible to develop a structured approach. This facilitated the identification of the key areas

The methodological stage of this study can be identified in three individual sections, namely the pre-pilot, pilot and final stage all of which will be individually explained in detail including how they were undertaken and how each methodological section influenced the formulation and execution of the next.

However preceding this, the key variables influencing the study will be illustrated through the formulation of the research hypothesis.

Hypothesis Formulation

Key variables of interest to this study.

- The quality of fit of the prosthetic limb as explained and perceived by the amputee/patient user.
- The quality of prosthetic limb comfort as explained and perceived by the amputee patient user.
The practicality of the prosthetic limb during every day activities as explained and perceived by the amputee patient user.

These variables are incorporated into the main hypothesis.

The Main Hypothesis
- There is a relationship between the fit, comfort and practicality and patients satisfaction with prosthetic limb.

The Null Hypothesis
- There is no relationship between the fit, comfort and practicality and patients satisfaction with prosthetic limb

Alternatively this null hypothesis can be explained in the following way. The fit, comfort and practicality of the prosthetic limb as perceived by the patient/user has no bearing on their lifestyle, paradoxically having no effect on patient/user psychological wellbeing, therefore differences in prosthetic design have no impact on patient/user satisfaction or use.

To facilitate the testing of these hypothesis it was necessary to test the following three methodological positions:

The frequency of prosthetic limb replacement/renewal is dependant on the age, physical and mental condition of the patient/user.
The number of prosthetic fittings is in correlation to the degree of patient satisfaction with their prosthetic.

The degree to which the patient/user can attain or regain a high standard of mobility following prosthetic fitment the greater the patient satisfaction and the lower the negative impact of disability.

6.2 Pre-Pilot Study - Preliminary Stage - Advanced Literature Review and Interviews

The pre pilot study consisted of two distinct sections. Firstly advancement from the literature review. Consisting of an investigation into the leading areas of patient prosthetic needs and prosthetic design considerations, namely the three previously identified sub-variables of fit, comfort and practicality and their consequent link to patient psychological wellbeing. The intent being the localisation and focusing of areas for questioning which could be used as a foundation for the second stage. In which interviews would be conducted with interested parties from all areas of the medical field including engineers, prosthetists, rehabilitation specialists, and orthopaedic doctors as well as the prosthetic recipients/users themselves. This would in-turn be used to generate a structure for the preliminary questionnaire.

This second stage interviewing was conducted thorough the British Isles by phone and in-person with parties from various institutions including NHS hospital trusts, manufacturing companies both domestic and international and the prosthetic wearing public. Interviews facilitated the generation of an overall picture of the industry and
clients, illustrating opinions from both parties, regarding design, satisfaction and undelivered requirements. Additionally the three preliminarily identified variables of fit, comfort and practicality were investigated in a general nature primarily with prosthetics users and prosthetists due to their increased awareness of the fundamentals involved.

This research approach and questioning was additionally driven by the outlined needs common to amputees as published by Fishmans (1959) as well as other key texts such as Kolb (1975). The Fishman (1959) study was used as it broadly itemises issues of common interest to all amputees highlighting that if satisfaction is not achieved with in each of the itinerary, the amputee will suffer various frustrations inherently resulting in the amputee experiencing psychological conflict and shifting behavioural extremes.

The seven main human needs common to amputees according to Fishman (1959):

- Physical function with a prosthesis.
- Visual and auditory considerations for the prosthesis.
- Comfort of the prosthesis.
- Energy expenditure in using the prosthesis.
- Achievement in various activities with use of a prosthesis.
- Economic security.
- Status and respect of one’s peers.
These amputee needs according to Fishman (1959) were used due to their broad criteria which when used in conjunction with Oppenheim’s (1966) suggestions for structured interviews facilitated focused exploration and identification of further avenues for questioning.

This structured approach to interviewing generated early feedback and clarification of research structure, identifying negative and positive areas for future study. In comparison to unstructured interview techniques which can be affected by the interviewer controlling and therefore guiding the outcome of the interview, the structured approach disallows ambiguity and eradicates possible interviewer induced bias, which can result from a rapport being built between the interviewer and the interviewee (Kumar, 1999).

Although this structured approach can lead to inflexibility within the questioning issues of interest that may be expressed during the interview can be noted and investigated upon completion. This technique guarantees the comprehensive collection of all pertinent information and ensures that all information can be collated and compared according to differing interview groups.

The overall format of the interview shared commonalities between the interviewee groups however a certain amount of tailored questioning was necessary. For example questions presented to medical staff such as the prosthetists and the orthopaedic doctor were two fold, firstly concentrating on the technological nature and mechanics of the prosthetics and amputee rehabilitation, and secondly investigating the medical profession attitude towards the patient.
This was in contrast to the questioning aimed at the patient, which concentrated on their personal opinions, focusing on their theories, methodologies and perceptions as patients. Primarily regarding issues which would directly affect their satisfaction with the prosthetic and indeed their disability. Therefore the majority of the questioning was directly interested in the key areas of fit, comfort, practicality and their psychological outlook as a prosthetic wearer/user and disabled person.

Using these two stages namely the advanced literature review and the interviews with the differing interested parties a more direct path of questioning was devised. This made it possible to generate a pilot questionnaire which would anticipate the diversity of responses and adjust accordingly.

6.3 The Pilot Stage - Pilot Questionnaire Preparation.

The two initial stages namely the advanced literature review and the interviews with interested parties facilitated the early implementation of a structured approach to the study. This allowed for the testing of topics identified at an early stage. This was further augmented and enhanced by the pilot questionnaire stage which converted these topics into operational avenues of questioning from which discriminatory variables could be identified.

The essential feature of the pilot questionnaire is to identify faults within its design, this is assessed in several ways. Firstly the content of the questionnaire is assessed to confirm whether all the topics found during the advanced literature review and the
interviews with all the interested groups are addressed and to ensure that each potential area of research has equal importance. Secondly the wording of the questionnaire is checked to ensure that recipients are not confused or alienated by ambiguous or unknown terminology. Thirdly the layout of the questionnaire is checked to allow the recipient adequate space in which to reply to questioning. Fourthly the questionnaire is checked to see if it could be altered to improve completion time, often changing question structure so as to facilitate ease of understanding accuracy of data and collation, by reducing answerable scope through tick boxes and point weighting scales. Finally but most importantly the pilot questionnaire once issued to the recipients can be used to identify other avenues of research that may have previously been overlooked within the field.

Upon satisfactory dry testing of the pilot questionnaire on colleagues, friends and peers it was necessary to identify the institutions at which to aim the pilot questionnaire. This is key to the study in order to satisfactorily and easily reach the sample audience. Which in this case and at this stage was obviously the amputee/patients themselves, again as stated earlier focusing on issues that would directly effect and be of interest to the lower limb amputee.

The identification of the locations at which the pilot study would be presented to patients was considered in some detail, allowing for the following simple criteria.

- The limb centres basic demographic location.
• The number of suitable pilot questionnaire recipients/patients in attendance of the limb centre.

• The comparability of the limb centres in terms of physical size and prosthetic staffing.

A preliminary limb centre location search identified, four limb centres for consideration (The National Health Service in Scotland, Information & Statistics Division, 1999), namely Cardiff Rockwood, Leicester General, Luton and Dunstable NHS Trust and Swansea Morriston.

Upon careful consideration aided by the extensive consultation with their organisational and medical staff it was decided that two centres would be approached for ethical approval and pilot questionnaire presentation namely Leicester General and Luton & Dunstable NHS trusts, as they most closely matched the location and patient attendance criteria. The importance of limb fitting centre attendance numbers was due to the number of respondents necessary for satisfactory statistical testing, as a satisfactory census group is considered to be a minimum of thirty respondents from each institution (Polgar and Thomas, 2000). Having selected the case studies and received ethical approval the pilot questionnaire was issued.
6.4 Limb Fitting Center Validity.

The two centres that participated in this study Leicester NHS Trust and the Luton and Dunstable NHS Trust were chosen due to their representative validity of the UKs limb fitting centres, with their choice identified through the following factors.

Each institution have similar geographical locations, located in urban, multi-cultural cities, with comparable population numbers. Demographically each limb-fitting center was representative, catering for a wide range of social groups, within the remit of the NHS. Both institutions cater for representative numbers of male and female patients to the national average with their age groups and amputation levels correspondingly representative of national statistical averages (Leonard Cheshire Charity, 2000).

The similarity of management structure held between both institutions and the majority of limb fitting centres within the UK, having between two to four prosthetists, one doctor, one center manager, one receptionist and two administration staff, which was also a consideration with respect of comparative representation.

Finally the representative nature of both centres involved in the study is confirmed by the prescribing habits of the centres being dependent on equipment suitability to the patient within cost restrictions rather than supplier tender.

Each factor was considered prior to contacting the limb fitting centres that were involved, identifying suitability and establishing willingness and ability to participate in this study.
6.5 The Pilot Stage - The Pilot Questionnaire, Results

Originating in two stages, including structured and non-structured interviews and a pilot questionnaire presented to two limb fitting centres their aim being to pre-test the final questionnaire. Ensuring its questioning was comprehensive in quality yet may not lead to the patient being put off by its wording or nature, as well as being short enough to be comfortably answered by the patient during their appointment at the limb centre.

The additional advantage of this pilot stage was the opportunity for respondents to become involved in a more direct manner with the study. Allowing them to contact the researcher directly or through the limb fitting centre.

The comprehensive nature of the questionnaire resulted in it being quite long in comparison to other studies in the prosthetics field. Comprising of 3 A4 pages it was decided that the amputee/patient would be asked to complete the pilot questionnaire during their appointment at the limb centre, and between examination by prosthetists. This was deemed most suitable as appointments can take elongated periods of time depending on the work to be conducted and the stage of limb fitting. In addition to the patient having the advantage of assistance from trained professionals, should they not fully understand a question and therefore be unable to answer it. However all respondents were given the opportunity to complete the pilot questionnaire at their leisure away from the limb fitting facility.
To successfully evaluate the findings from the pilot questionnaire aimed at the prosthetics patient/user questions regarding satisfaction and attitudes the Fishman 1959 study was assessed and used as conformation of basic confirmed of research findings (Fishman, 1959).

6.6 Pilot Questionnaire Development.

The pilot questionnaire as stated earlier was proposed to investigate several factors regarding the design of what would ultimately become the final questionnaire. Assessing the value of questions and investigating the possibility of previously unidentified variables. The generation of the pilot questionnaire can be illustrated within three broad areas.

6.6.1 Questionnaire Rationale - Content, Wording, Order and Management

Moser and Kalton (1973) describe the rationale behind the use of pilot surveys as,

"exceedingly difficult to plan a survey without a great deal of knowledge of its subject matter, the population it is to cover, the way people react to the questions and paradoxical as it sounds, even the answers they are likely to give

They proceeded to say that,

"Common sense suggests that the necessity of doing a few interviews or sending out trial forms by way of preparing the main survey, such as informal
trial and error is as much part of the preliminary study as are talks with experts and study of the literature.

Moser and Kalton (1973) further describe the purpose of the pilot questionnaire stage and was used to give guidance in the following ways.

- The suitability of the possible sample group from which the questionnaire would be selected.

- The variability of the sample groups population. Suggested as guidance for the suitable sample population size. Proceeding research indicated the suitability of a minimum number of 30 respondents would be suitable for research conducted within health sciences (Polgar, Thomas, 2000).

- The possibility of respondents refusal to completed the pilot questionnaire, facilitating the estimation of response rate which can be used as a guide towards the expected completion numbers of the final questionnaire.

- Suitability of the data collection method. As it had already been decided that the questionnaire was the most suitable mode of research technique that could be used in this study, the pilot questionnaire was used to test patient/user responses which would be altered for the final questionnaire.

- Questionnaire adequacy. Although the questionnaire had been previously tested on colleagues, staff and friends the submission of the pilot questionnaire to the
limb centres of two United Kingdom hospitals offered the opportunity to question a sample group population of a similar makeup to that which would be approached for the final questionnaire.

As a result of the above guidance the questionnaire was scrutinized by the following criteria.

- Questionnaire contents with regard to the question aim and research avenue under investigation.
- Questionnaire wording adequacy, including the suitability and simplicity of terminology
- Questionnaire layout, with respect to sufficiency of response space provided.
- Design of question structure, concerning the simplicity of question answering method, such as tick box or scaling.
- The identification of unidentified research opportunities and avenues.

6.6.2 Questionnaire Content.

The pilot questionnaire facilitated the identification of possible variables which had not previously become apparent from earlier stages of the study as well as issues regarding its design including layout, wording and content, regarding the identified variables of fit comfort and practicality and their impact of patient psyche. Specifically question targeting was aimed at the constituents of user satisfaction addressing the differing facets of each constituent.
As the pilot questionnaires contents are concerned with the identified variables and their link to user satisfaction an analysis of the individual questions is unnecessary. Therefore, the pilot questionnaire will be illustrated in terms of question type categorized in several ways including attitudinal based and factual based questioning, devised by Selltiz et al, (1962).

Selltiz et al’s categorization of questionnaire question type identifies questions aimed at the attainment of ‘fact’. Such questions in terms of this particular study can be primarily seen in the initial section designed to establish factual information regarding the patient/user, such as age, sex, and disability description i.e. absent left leg, left arm etc. Other factual based questions were designed to investigate patient/user knowledge as well as satisfaction inquiring as to their understanding of the limb fitting process and their attendance at the limb fitting centres. With internal consistency being crosstabulated with the appropriate variable.

The attainment of contextual or content based information was the second question type. This was ensured by asking respondents questions pertaining to their perception of fact, or, what they believed to be fact. Patient/users were asked a variety of content questions including “Why in your opinion is your walking distance limited?”, such questioning allowed for the establishment of patient/user perception regarding all the previously identified variables.

The third question type was aimed at the assessment of patient/user feelings. Evident in every section of the pilot questionnaire, patient/users were asked for example “Do you feel that you could walk better if more money was spent on the limbs?".
Questions such as this were important to establish patient/user satisfaction with regards to the level of care in receipt and their feeling with regards to their prosthetics.

The fourth question content type encompassed questions aimed at discovering standard of action. The fifth question type was concerned mainly with present or past behaviour, which could be classified as a sub category of the factual based questions but is justified as independent by (Sellitz et al, 1962), in the following way.

"We single out this type of ‘Fact’ for special notice because of the value of knowledge of the past or present behaviour. How a person has behaved in the past in a certain type of situation, is in the absence of contradictory evidence, an indication of what his future behaviour will be in similar situations".

An example of this type of question used in the pilot questionnaire is, "How long does it take to fit you with a new artificial limb?" measured in the "Number of Weeks," and the "Number of Appointments".

The final question content type of Sellitz et al, (1962) is focused at the conscious reasoning for beliefs, feelings, policies, and behaviour. An example of such a question within the pilot questionnaire was "Does your artificial limb hamper your movement in any way?". To focus the question, respondents were offered the following categories as options "Due to fit", "Design", "Technology", "Own Limitations" and "Other", offering respondents an opportunity to answer an with alternative.
This rational has attempted to explain the aim of the pilot questionnaire examining question impetus and the motivation behind question design. The following section will illustrate the order in which the questioning was compiled and the reasoning behind it.

6.6.3 Question Order - Supplemental Information

Under the NHS Hospital Trust guidelines all researchers wishing to present a study must comply with ethical protocols. As a result two forms of supplemental information were compiled and added to the questionnaire. Firstly a letter of invitation, informing the patient of the nature of the study, requesting their participation and permission to complete the questionnaire, and secondly, the "patient information booklet". This stated the project title, a brief invitation outlining the study and details pertaining to the principal investigator. Additionally it goes on to address questions that may be ask by the patient regarding their participation in the study such as what would be expected of them and where their participation ended. Questions were as follows:

What is the purpose of the study?
Why have I been chosen?
What will happen to me if I take part?
Do I have to take part?
What are the possible benefits of taking part?
Will my taking part in the study be kept confidential?
What if I am harmed by the study?
What will happen to the results of the research study?

These questions were intended to allay fears and possible suspicions regarding patient involvement. Establishing that this questionnaire was design based rather than medical and assuring the confidentiality of their responses.

6.6.4 Questionnaire Question Sequence

The sequence of the questions within the questionnaire can be discussed in two ways. Firstly the sequence of sections and secondly the sequence of questions. The principle by which this order was decided was suggested by Moser and Kalton (1973), whose advice had previously been used in the construction of the interview questioning but which was also applicable for questionnaires.

“At the start of the interview, the respondent is unsure of himself and so opening questions should be the one to put him at ease and build up a rapport between him and the interviewer. They should be interesting questions which he should have no difficulty in answering, and they should not be on sensitive topics, for otherwise, he may refuse to continue with the interview. The questions should then proceed in a logical manner, moving from topic to topic in a way that indicates to the respondent the relationship between the questions; where an obvious break in the subject matter occurs it is usually advisable to give a sentence or two explaining the break and the relevance of the new set of questions. Since questions on highly sensitive topics may lead to the respondents refusing the interview, they may be left until last, then if a
refusal is met, relatively little information is lost” (Sellitz et al, 1962) (Mose and, Kalton, 1973).

Using this advice as a crude structure for the pilot questionnaire gave rise to questions relating to respondents personal details being presented first, thus building a rapport, due to their answerable simplicity.

Concerning the natural progression and flow of the questions Sellitz et al (1962) suggest that respondents find it easier to express their attitudes following the clear illustration of the situation answerable. Additionally question sequencing was important to maintain respondents interest, this was countered by placing factual and attitudinal questioning throughout the questionnaire and assessing clarity of wording which will be described in the next section.

6.6.5 Question Language

Numerous works (for example, Sellitz et al, 1962; Moser and Kalton, 1973; Kumar, 1999) describe areas of questioning that should be treated carefully ranging from the specificity of questioning, leading nature of questioning, the difficulty of hypothetical question interpretation, intrusive embarrassing questioning and questions directed at memory. All of these factors were used in rudimentary assessment of the questionnaire adequacy conducted upon colleague, staff and friends.

Furthermore the pilot questionnaire during its submission to the NHS Hospital trusts and its completion by respondents facilitated the testing of language and wording,
thus eliminating ambiguous wording, providing enough space for responses and the alteration and improving of structure.

6.6.6 Pilot Questionnaire Findings

As previously discussed the intention of the pilot questionnaire in any study is mainly exploration of questionnaire design and the assessment of its suitability regarding layout, wording and content. As a consequence the main body of the pilot questionnaire contained many open ended questions, therefore question coding and analysis was made after a substantial number of questionnaires had been returned.

This coding was completed in the following way. All answers to closed questions were assigned numerical codes, with a simple scoring method being devised for questions of that nature. Open questions were listed and classified which aided the design of the final questionnaire through pre-coding possible answers.

6.6.7 Pilot Questionnaire Data Analysis

Data analysis was conducted through via the computer package, SPSS (Statistical Package for the Social Sciences) chosen, for its popularity in use within the social science field and its use within the prosthetics field (Nie et al, 1975).
The following features of the SPSS package were used to analyze the data.

**Frequencies**

The measure of absolute numbers or percentages (The number of respondents which fall into a category or variable).

**Crosstabulations**

A comparative variable measurement (The number of respondents that fall into a response category when consideration is made between two variables).

Each crosstabulation statistic used chi-square as its index of association. Non Parametric Test – the relationship between dependant and independent variables were tested by crosstabulating.

The use of data gained from the pilot questionnaire and analysed by the above methods had repercussions upon the final questionnaire.

**6.6.8 Review and Appraisal**

In this section the results of the pilot questionnaire are not given individual attention but rather they are assessed according to the implications that they have had on the construction and design of the final questionnaire.
What was discovered from the pilot questionnaire and its effect on the final sample group, question content, question sequence, question wording and the final presentation to the patient/user respondents.

As previously explained the pilot questionnaire was presented to two NHS trust hospitals namely Leicester General and the Luton and Dunstable NHS trust hospitals which proved to be a good choice due to their interest and indeed their assistance. As a result it was decided that the final questionnaire would be presented to the same institutions, following the ethical approval of the revised and altered final questionnaire with the same criteria for approaching respondents and the same sample group size of thirty in each hospital (Polgar and Thomas, 2000).

6.7 The Final Questionnaire - Methodology and Refinement

The final stage used the reconstructed questionnaire which can be accepted as the final modification and format of structuring upon the study, with respondents choice of topics being further limited and focused.

The detailed and exhaustive modification of the research from its conception through the initial stages of the literature review to the advanced literature review, interviews, pilot questionnaire to the final questionnaire demonstrate the refinement of concept and methodology to the production of quantitative data.
6.7.1 Final Questionnaire - Question Content.

The transformation from the pilot questionnaire to the finalised questionnaire was significant due to data analysis and controls imposed on its quality. Changes included the exclusion of some avenues of research and the inclusion of others, also evident in the questioning. Redundant avenues of inquiry were superseded by questioning more directly aimed at the establishment and analysis of fit, comfort, and practicality and their effects on the patients psyche, quality of life and satisfaction.

However the most major change that was implemented from the pilot to the finalised questionnaire was its modification in order to assess the previously unidentified variable of patient knowledge/communication regarding the limb fitting process, their disability and their prosthetics. Thus the final questionnaire included questions that would probe into this avenue of research allowing for the identification of this variable that had not been considered or evident from the pilot questionnaire or indeed the extensive literature review.

Although affecting questionnaire sequence the same principles were applied to their inclusion and presence in the questionnaire.

6.7.2 Final Questionnaire - Questionnaire Distribution

As with the pilot questionnaire the finalised version was treated in identically the same manner, presented to same sized sample group size of thirty in each hospital (Polgar and Thomas, 2000). This time however the questionnaire was presented to the
patient/users by a member of the hospital staff, inadvertently aiding the random nature of the questionnaire.

6.7.3 Final Questionnaire - Problems Encountered

Problems that were encountered by the acquisition of information during the research study were sparse. However, as previously stated the questionnaire was randomly presented to recipients, as a result several respondents required assistance in filling in the questionnaire due to various disabilities which affected dexterity and the manipulation of writing. Thankfully this was overcome by the perseverance and understanding of the limb fitting centres staff and administration whom aided the patient/users in the questionnaire completion.

6.7.4 Final Questionnaire - Hospital Staff Assistance

The support and kindness of the administration staff and medical staff of both hospitals was superb. This can be illustrated by the final questionnaire as the hospital staff offered their assistance, approaching respondents and indeed assisting them to complete the questionnaire, an offer that was kindly accepted as it further removed the possibility of bias from the study.

6.7.5 Final Questionnaire - Covering Letters

Permission to undertake the research study was requested along the guidelines of each NHS Hospital Trust, completing detailed research protocols, identifying information
gained, means of acquisition and final research goals. In addition to information pertaining to patient security and anonymity. Hospital Guideline documentation and other relevant information regarding the undertaking of this study can be found in the appendix.

6.7.6 Final Questionnaire - Anonymity

It has been indicated that the response to questionnaires within the United Kingdom can be influenced by the colour or race of the interviewer (Oppenheim, 1966) as well as other factors including the time the respondents filled in the questionnaire. Therefore the fact that the questionnaire was distributed by the receptionists at the limb fitting centres minimises the effect of such contaminant factors. The results of the final questionnaire can be seen in the following chapters.

6.8 Final Questionnaire - Conclusions

From an early stage it was identified that the use of questionnaires as the primary research tool was paramount in obtain information regarding the patient/users satisfaction in respect of fit, comfort and practicality of their artificial limbs. However this information was supplemented by interviews with members of the medical fraternity, including prosthetic engineers, prosthetists, orthopaedic doctors and limb centre administrative staff as well as the patient/users themselves.

The process by which the researcher conducted the study facilitated the general data and information gathering with respect to all areas of the study. With the final
questionnaire gathering data necessary for the identification of the main factors, affecting the patient/users satisfaction with their prosthetic, both factually and perception based.

Factual data included information pertaining to patient age, sex, age at loss of limb and so on with perception based information being built up of patients/users feelings regarding their treatment and satisfaction with their prosthetic including indicators of satisfaction within life style and the prosthetics effectiveness.

The undertaking of the pilot questionnaire empowered the researcher with the necessary tools by which to adequately and objectively assess the appropriateness of the research method, allowing for familiarisation with the questionnaire as a research tool. Aiding the identification of limitations within the method such as the use of potentially ambiguous wording and misleading or alternatively perceived questioning.

As a result of this learning curve extensive modification of thinking and indeed questionnaire was initialised. Although primarily intended as a learning exercise and a means of gaining experience in the administration and control of questionnaire data management.

The pilot questionnaire highlighted invaluable findings used to prove issues of interest to the patient/amputee and variables that had not previously become evident from the extensive literature review. Indeed the variable of patient knowledge/communication regarding the limb fitting process, their disability and their prosthetics had become a visible and dominant variable in the final questionnaire (Appendix B).
Due to the nature of the study and evolution of the methodology the following diagram simply illustrates the basic conceptualisation and stages of the research approach (Appendix C).
Conceptual Model of Research Methodology

STEP I
Formulation of Research Question, Aims, Basic Hypothesis and Variables for Evaluation

STEP II
Conceptualising of Research Design Via Questionnaire Method

STEP III
Pilot Questionnaire Evaluation and Assessment of Variables (Fit, Comfort & Practicality)

STEP IV
Final Questionnaire Assessment of Fit Comfort, Practicality and Communication

STEP V
Analysis of Data from Final Questionnaire Via Statistical Analysis

STEP VI
Interpretation of Data and Presentation of Findings Through Thesis

Processing and Analysis of Statistical Data Through SPSS (Statistical Program for the Social Sciences)

Communication Identified as having a Greater Impact on Patient Satisfaction Than Fit, Comfort and Practicality
CHAPTER 7

BROAD-BASED FINDINGS: MAIN VARIABLES AND THEIR IMPACT ON PATIENT SATISFACTION

7.1 Introduction

The purpose of this study is to explore and investigate the strength of the relationship between the main variables under investigation, namely fit, comfort, practicality and communication in reference to patient prosthetic satisfaction, which will be illustrated in statistical terms during this chapter. In addition to this section 7.3 will give a brief guide to the format of the statistics.

As a result of such an investigation into issues that are predominantly subjective it was necessary to gain a deeper understanding of the relationships involved. This included background factors pertaining to the patients, financial security, age, sex, education level and so on.

These factors were investigated in two hospitals, Leicester Glenfield NHS Trust and the Luton and Dunstable NHS Trust, by means of observational techniques, interviews both live and by telephone and questionnaires. Although substantial information was gained from the initial pilot study, which was also conducted at the Leicester and Luton and Dunstable NHS Trusts this chapter will primarily focus on the information gained from the final study.
The following will summarise through the use of statistical analysis via crosstabulations, frequencies and correlation's the patient respondents answers to the questionnaires which were derived from the extensive literature search and the assessment of previously conducted studies dealing with similar issues including Fishman (1959). From these derivations or sub-variables ten possible relationships and positions were identified, with regards to user satisfaction with the prosthetic. Namely:

- Patient location.
  
  *Referring to Limb fitting centre that the patient attends.*

- Gender or sex.
  
  *Whether the patient user is male or female.*

- Age.
  
  *Patients age at the time information was gathered.*

- Age at time of amputation.
  
  *The age of the patient at the time the medical surgery or disability occurred.*

- Level of amputation (which limb/s did you lose).
  
  *The description of the amputation, being above or below major joints, left or right side or combination.*

- Occupation Prior.
  
  *The patients occupation prior amputation if applicable.*

- Occupation Post.
  
  *The patients occupation post amputation if applicable.*

- Approximate income Prior.
  
  *The patients level of income prior amputation if applicable.*
Approximate income Post.

*The patients level of income post amputation if applicable.*

Education Level.

*The highest level of educational qualification attained.*

In conjunction with these derivations additional tertiary variables were examined by means of the final questionnaire and categorized in terms of fit, comfort, practicality and communication, assessed in order to establish their impact on patient prosthesis satisfaction.

In order to test the relationships between these variables and patient satisfaction with their prosthesis, the first stage was the use of crosstabulations with Chi-square and significance levels to test for any association (Colman and Corston, 2000). This was conducted on both the hospitals used in the study separately and then together.

It must be stated, that although these were a sample of the relationships identified, however, other areas of interest were also explored. These included background variables relating to whether the patients activities, activity levels and if they had other disabled friends of relations, had an impact on their personal satisfaction with their prosthetic and or disability. Additionally the emergence of external factors relating to not only the satisfaction levels of patient users with their prosthesis but also their satisfaction in relation to the limb fitting service as a whole were considered and explored.
These included:

- The degree to which the disabled person has adjusted to their handicap.

- How well the prosthesis wearer interacts with their peers both on a physical and psychological plane, including potential indicators towards feelings of inadequacy or limited ability. This derivation was also considered in respect of the causation of the disability. Whether the disability was as a result of congenital deformity, accident, or through illness or disease which often have concomitant complications.

- The patient's activity levels while wearing the prosthesis. Referring to the social, educational and recreational activities undertaken while wearing the prosthesis, including their success and accessibility to such activities.

- Understanding of their disability, causation and rehabilitation process, from the potential of surgery through to limb fitting and on to walking training. As a consequence of what is an unforeseen eventuality in any one's life, it is often found within the literature that the patient user is ill-equipped in terms of knowledge and information regarding the stages that they are likely to experience during their rehabilitation.

- Their psychological wellbeing, including outlook on life, level of optimism, confidence and enthusiasm. The literature suggests that the psychological outlook held by the patient has a bearing on the outcomes following and during
rehabilitation, positive thinking promoting increased levels of rehabilitation
success.

- The number of times that the hospital had been visited in total, irrespective of
disability causation, which from the literature (Williamson, 1995) suggested that
the more frequent or extended duration’s in hospital reduced patient satisfaction
with both the level of service and their prosthesis

- The type of treatment received whether invasive or rehabilitative, suggesting that
the causation of the disability impacted on the user’s satisfaction as a result of
more intrusive procedures leading to feelings of negativity. For example patients
that had a normal life and body image until the amputation were expected to have
increased issues leading to greater dissatisfaction.

- Their socio-economic background and stability, relating to the fact that many
disabled people have lower economic stability as a result of their disability than
those without a disability.

The reasons behind the consideration of the above variables are many but foremost is
their separate and combined potential impact on overall patient prosthetic satisfaction.
Numerous studies have suggested such background issues relating to patient
prosthetic satisfaction which can potentially invade various areas of the patients life to
differing degrees from rehabilitation, to career progression and even social or
relationship building.
The semantics used within the literature and guidance the perception of the three main variables of fit, comfort and practicality were assessed through the following means.

(a) Variable 1 Fit.
The issue of fit was investigated in several ways such as, the identification of need and contributing factors connected with the fit of the prosthetic, the limb type, model and make, whether the patient used stump socks and their desired fit whether slight movement or close. Such questioning was used to establish whether patient needs differed regarding the issue of fit.

(b) Variable 2 Comfort.
In terms of prosthetic comfort the literature assumes that the relationship between satisfaction and comfort exists as a result of the length of time that a patient can undertake an activity in comfort. This was assessed by questions relating to frequency of requirements, duration of activity and the effects if any the prosthesis had on their comfort or the stump/residual limb in general.

(c) Variable 3 Practicality.
Prosthetic Practicality, established during the literature review was measured by means of questions associated with lifestyle, such as, the length of time prosthetics
were worn and whether stump socks proved a problem. Respondents were also asked whether the prosthetic hampered movement and their impairment.

(d) Variable 4 Communication.

The issue of communication relates to the level at which the patient communicates their needs to the prosthetist, this was investigated in several ways such as, the identification of need and contributing factors connected with attainment of desired levels of prosthetic satisfaction. Such questioning was conducted to establish the level of patient knowledge, education and understanding of the limb fitting process and their disability in general, used to establish whether patient/prosthetist communication affected the level of satisfaction and quality of the delivered limb.

7.3 Patient Prosthetic Satisfaction in Relation to the Key Variables

These derivations identified from the literature reviews and questionnaire are now examined in more detail through the illustration of the studies findings with regard to user satisfaction with the prosthetic in terms of the three measurable variable categories, fit, comfort, practicality and communication.

As stated earlier investigations were conducted in two locations namely Leicester NHS Trusts and Luton and Dunstable NHS Trusts so as to establish findings that indicated variables of interest within the scope of patient prosthetic satisfaction.

The ten previously mentioned derivations were crosstabulated, using SPSS for Windows. The chi-square was used as the first test of association between the
variables, with only variables of 0.00 or 100% confidence of a relationship being tested using the non-parametric tests Kendall tau-b and Spearman’s rho to assess their strength thus identifying any significant associations. Variables having a Chi – square of 100% will be assessed and reported on in chapter 8 as these variables were proven to have a strong statistical relationship and were of pertinence to this study.

The use of Chi – square at 0.00 significance level (100% confidence) was decided upon, due to the large number of significant relationships at 100% confidence between the two variables. Although according to Siegel (1956), 95% would have been acceptable as an indication of a strong correlation between two variables at 0.05 significance level (95% confidence) with a chi – square above 9.49 with a degree of freedom of 4 has a sufficient statistical relevance (Siegel, 1956).

(See page 332, 362 or Appendix E for tables).

Variables were structured within three categories. Firstly, main variables referring to the fit, comfort, practicality and communication, secondly derivations or sub-variables referring to the ten possible origins of patient prosthetic satisfaction indicated in section 7.1 and finally tertiary variables formed from the questions asked in the questionnaire.

The results from the variables will now be illustrated in the following sections.
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(See page 332, 362 or Appendix E for tables).

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The results from the variables will now be illustrated in the following sections.
7.4 Main Variable 1 : Fit

(a) Derivation 1 : Patient location in conjunction with tertiary variables.

(i) Tertiary Variable : How often do you need a new artificial limb?

The results to this question are as follows. Within the Leicester NHS Trust 7 out of 30 (23%), and 5 out of 30 (16.6%) in the Luton & Dunstable NHS Trust reported that they needed new artificial limbs once a year. 40% (12 out of 30) in the Leicester NHS Trust and 16.6% (5 out of 30) in the Luton & Dunstable NHS Trust reported that they needed new artificial limbs every two years. 7 out of 30 (23%) in the Leicester NHS Trust and 10 out of 30 (33.3%) in the Luton & Dunstable NHS Trust reported that they needed new artificial limbs every 5 years. None of the patients in Leicester NHS Trust and 5 (16.6%) in the Luton & Dunstable NHS Trust responded other to the question. Finally 13.3% (4 out of 30) in Leicester NHS Trust and 16.6% (5 out of 30) did not respond to the question.

These results seemed to suggest that due to the fit of the prosthetic, patients within the Leicester NHS Trust received new limbs more often than those did in the Luton & Dunstable NHS Trust. The association between the two variables being patient location and the frequency of needing new limbs is (Chi – square = 8.856, significance = 0.06), this suggests a 94% confidence of a relationship between the two variables.

There are many significant conclusions that can be drawn from these data including, that depending on which limb-fitting center the patient attendants may vary the
quality of the prosthetic and therefore the duration or life span of the prosthetic before it needs to be replaced. This is therefore likely to increase NHS expenditure.

Alternatively this data may suggest that the frequency of replacement prosthetics may be due to a more patient satisfaction orientated limb fitting center, where the main concern is to deliver and attain higher levels of patient satisfaction, thus replacing prostheses in line with prostheteist experience or beliefs regarding limb renewal.

Due to the (Chi – square = 8.856, significance = 0.06), indicating a 94% confidence of a relationship between the two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance for investigation within this study and was not subjected to the non parametric tests or further examination.

(ii) Tertiary Variable: Does your artificial limb hamper your movement due to fit?

Patient responded in the following ways. 33.3% (10 out of 30) in Leicester NHS Trust and 20% (6 out of 30) in the Luton & Dunstable NHS Trust responded YES, 17 out of 30 (56.6%) in Leicester NHS Trust and 13 out of 30 (43.3%) in the Luton & Dunstable NHS Trust responded NO. With 3 out of 30 patients (3.3%) in Leicester NHS Trust and 11 out of 30 patients (36.6%) in the Luton & Dunstable NHS Trust not giving a response.
These data suggest that there may be another reason behind or in addition to issues regarding the fit of the prosthesis affecting patient movement with the correlation between the variables of location and hampered movement on the grounds of fit, with a (Chi – square = 6.105, significance = 0.04). Which suggests a 96% confidence of a relationship between the two variables.

This may be as a result of several reasons whether the patient has any concomitant problems, such as breathing difficulties or cardiovascular limitations this may reduce their mobility thus hampering movement. Furthermore, the age of the patient may result in their movement being limited through old age.

Due to this relationship being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance for investigation within this study and was not subjected to the non parametric tests or further examination.

(iii) Tertiary Variable : Do you feel you walk well in your artificial limb/s?

23 patients out of 30 (76.6%) in Leicester NHS Trust and 15 patients out of 30 (50%) in the Luton & Dunstable NHS Trust responded YES, (13.3%) 4 patients out of 30 in Leicester NHS Trust and (36.6%) 11 out of 30 in the Luton & Dunstable NHS Trust responded NO. With 3 out of 30 patients (3.3%) in Leicester NHS Trust and 4 out of 30 patients (13.6%) in the Luton & Dunstable NHS Trust not giving a response.
These results seem to suggest an association between patient location and patient satisfaction with their walking ability (Chi-square = 5.094, significance = 0.07), this suggests a 93% confidence of a relationship between the two variables.

This date suggests that there are more patients in attendance at the Leicester NHS Trust limb fitting center who feel that they walk well than at the Luton and Dunstable NHS Trust. However, this may be due to the age of the respondents, which was not tested in conjunction to this question. Alternatively this may be due to a better quality standard of delivered prosthetic.

Due to the relationship between these two variables being under 0.00 or 100% confidence of an association as required for this study, this variable was not considered to have sufficient statistical relevance for this study and was not subjected to any non-parametric tests or further examination.

(b) Derivation 2: Patient Gender.

(i) Tertiary Variable: Age at time of limb loss.

Grouped according to respondents age starting with 0 referring to birth and ending at 100 years of age, the results are as follows. Within the census age group of since birth to ten years of age, 2 males out of 42 (4.7%) and no females were born with congenital limb deficiency or lost a limb. Between the ages of 11 to 20, 6 out of 42 (14.2%) males and 6 out of 18 (33.3%) females lost their limb/s. (4.7%) 2 out of 42 males and no females lost their limb/s between the ages of 21 to 30. Between the ages of 31 to 40, no males and 4 females out of 18 (22%) lost their limb/s. (4.7%) 2 out of
42 males and no females lost their limb/s between the ages of 41 to 50. Between the ages of 51 to 60, 12 out of 42 (28.5%) of males and no females lost their limb/s. (19%) 8 out of 42 males and 2 females out of 18 (11.1%) lost their limb/s between the ages of 61 to 70. Between the ages of 71 to 80, 6 out of 42 (14.2%) of males and no females lost their limb/s. (9.5%) 4 out of 42 males and 6 females out of 18 (33.3%) lost their limb/s between the ages of 81 to 100.

From the results obtained it was evident that there was an association between the patients gender and the age at the time they lost their limb/s (Chi – square = 26.667, significance = 0.00). This suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = -.02 ) and (Spearman’s roe = -.06 ) which will be discussed in chapter 8.

(ii) Tertiary Variable: How often do you wear your artificial limb/s?

Patients were asked to illustrate the frequency by which they wear of their prosthesis. 40 males out of 42 (95.2) and 15 females out of 18 (83.3%) responded that they wore their prosthesis every day. No males and 2 females out of 18 (11.1%) responded that they wore their prosthesis once or twice a week, while 2 males out of 42 (4.7%) and 1 female out of 18 (5.5%) did not respond to the question.

The crosstabulation of these variables seems to suggest that there is a relationship between the variables pertaining to the patients gender and how often they wear their
prosthesis (Chi – square = 4.877, significance = 0.08), this suggests a 92% confidence of a relationship between the two variables.

This data may suggest that there are more patients that are willing to persever and overcome their disability than those who are not. Alternatively this data may suggest that patients are forced to wear their prosthetics in order to conduct their lives, although their prosthetics may not be suitable.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(c) Derivation 3 : Patient Age

(i) Tertiary Variable: Age at time of limb loss?

Patients currently between the ages of 11 to 20 reported the age of their limb loss. 2 out of 4 (50%) were born with congenital absence or lost their limb/s between the ages of 0 and 10 and 50% (2 out of 4) reported loosing their limb/s between the ages of 11 to 20.

Between the ages of 31 to 40, 2 (100%) patients reported having lost their limb between the age of 11 to 20. Between the ages of 41 to 50, 4 (100%) patients reported having lost their limb between the age of 11 to 20.
Patients between the ages of 51 to 60 reported the age of their limb loss in the following ways. 4 out of 14 (28.5%) lost their limb/s between the ages of 11 to 20, 2 out of 14 (14.2%) lost their limb/s between the ages of 31 to 40 and 8 out of 14 (57.1%) reported losing their limb/s between the ages of 51 to 60.

Patients currently between the ages of 61 to 70 reported the age of their limb loss in the following ways. 33.3% (2 out of 6) lost their limb/s between the ages of 21 to 30 and 66.6% (4 out of 6) lost their limb between the ages of 71 to 80.

Patients between the ages of 71 to 80 reported the age of their limb loss in the following ways. 12.5% (2 out of 16) lost their limb/s between the ages of 41 to 50, 25% (4 out of 16) lost their limb between the ages of 51 to 60. 25% (4 out of 16) lost the age of their limb between the ages of 61 to 70 and 37.5% (6 out of 16) lost their limb between the ages of 71 to 80.

Patients currently between the ages of 81 to 100 reported the age of their limb loss in the following ways. 14.2% (2 out of 14) lost their limb/s between the ages of 31 to 40, 14.2% (2 out of 14) lost their limb between the ages of 51 to 60 and 71.4% (10 out of 14) lost their limb between the ages of 81 to 100.

These variables relating to current patient age and age at time of amputation seem to suggest that there is a relationship (Chi - square = 163.714, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests ( Kendall tau-b = .71 ) and (Spearman’s r = .81 ) which will be discussed in chapter 8.
(ii) Tertiary Variable: Which limb/s did you lose?

The following illustrated patient ages according to the loss of their limbs.

Left leg below knee, 2 out of 14 (14.2%) of 51 to 60 year olds, 2 out of 14 (14.2%) of 61 to 70 year olds, 6 out of 14 (42.8%) of 71 to 80 year olds and 4 out of 14 (28.5%) of 81 to 100 year olds have lost their left leg below knee.

Right leg below knee, 20% (4 out of 20) of 11 to 20 year olds, 10% (2 out of 20) of 41 to 50 year olds, 10% (2 out of 20) of 51 to 60 year olds, 30% (6 out of 20) of 71 to 80 year olds and 30% (6 out of 20) of 81 to 100 year olds.

Left leg above knee, 2 out of 8 (25%) of 31 to 40 year olds, 6 out of 8 (75%) of 51 to 60 year olds, 2 out of 8 (25%) of 61 to 70 year olds, 4 out of 8 (50%) of 71 to 80 year olds and 2 out of 8 (25%) of 81 to 100 year olds.

Right leg above knee, 25% (2 out of 8) of 41 to 50 year olds, 25% (2 out of 8) of 51 to 60 year olds, 25% (2 out of 8) of 61 to 70 year olds and 25% (2 out of 8) of 81 to 100 year old. Finally between the ages of 51 to 60, 2 patients had lost both legs below knee.

The crosstabulation of these variables seems to suggest that there is a relationship between the variables pertaining to the patients age and their loss of limb (Chi -
square = 38.769, significance = 0.02), this suggests a 98% confidence of a relationship between the two variables.

This relationship may suggest that patients having experienced either the loss of both limbs may be less satisfied with their prosthetic than patients that have experienced the loss of only one limb. Similarly this relationship may suggest that the patient with below knee amputation may have a better level of fit than those who have above knee amputations.

This data also confirms the representative nature of the sample group being predominantly made up of right leg knee below amputees.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(iii) Tertiary Variable: Reason for limb loss?

The following illustrates the causation of patients limb loss. 25% (2 out of 8) of 31 to 40 year olds, 25% (2 out of 8) of 41 to 50 year olds. 25% (2 out of 8) of 61 to 70 year olds, 25% (2 out of 8) of 81 to 100 year old all lost their limb through an accident.

12 out of 32 patients (37.5%) between 41 to 50 years old, 2 out of 32 patients (6.25%) between 61 to 70 years old, 8 out of 32 patients (25%) between 71 to 80 years old. 10
out of 32 patients (31.2%) between the 81 to 100 years old all lost their limb through illness.

4 patients in total between the ages of 11 to 20 reported that they had been born with congenital limb deficiency. Additionally in total 10 patients reported other reasons for limb loss that were not categorized within the questioning, neither did the respondents specify.

Finally, 2 out of 6 patients (33.3%) between the age of 61 to 70, 2 out of 6 patients (33.3%) between the age of 71 to 80 and 2 out of 6 patients (33.3%) between the age of 81 to 100 years old, reported that they had lost a limb as a result of war.

The crosstabulation of the two variables seems to indicate that there is a 100% confidence of a relationship (Chi – square = 98.253, significance =0.00), therefore it was subjected to the non-parametric tests (Kendall tau-b = .71 ) and (Spearman’s roe = .81 ) which will be discussed in chapter 8.

(d) Derivation 4 : Level of education

(i) Tertiary Variable : If you have been disabled since birth what was the prognosis?

This question was not applicable to 52 out of the total of 60 patients questioned. However, 2 patients out of 60 (3.3%) who had lost their limb due to cancer were educated to degree level. 2 out of 60 (3.3%) who had lost their limb due to arterial blockages said that they had no education. From the total 2 patient out of 60 (3.3%)
who had lost their limb due to spina bifida one had a grammar school education and the other had an HND/HNC education. Finally 2 patients reported other reasons for their congenital disability and that they had no qualifications.

This data seems to suggest a relationship between the variables (Chi – square = 37.962, significance = 0.09) this suggests a 91% confidence of a relationship between the two variables.

From this data it is fair to suggest that patients having lost their limbs have a lower level of education than those who have not. This is especially true of patients who have congenital abnormalities. This variable may suggest that their level of education and therefore their ability to relay adequate complaint, or understand instruction from the prosthetist/medical staff, impact patient’s satisfaction with respect of the fit of their prosthetics.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(ii) Tertiary Variable : Does your artificial limb hamper your movement due to fit?

The data gained from this question are as follows. A total of 16 out of 60 (26.6%) responded yes, that the fit of their artificial limb did hamper their movement and these
patients were educated in the following ways. 2 out of 16 (12.5%) had a grammar school education, 1 out of 16 (6.25%) had A levels, 1 out of 16 (6.25%) had a degree, 1 out of 16 (6.25%) had GCSEs/Olevels/GCEs, 1 out of 16 (6.25%) reported other. Finally 10 out of 30 (33.3%) had no qualifications.

From the 30 out of 60 (50%) patients that responded no, the fit of their artificial limb did not hamper their movement, the data is as follows. 20% (6 out of 30) had a grammar school education, 13.3% (4 out of 30) had A levels, 6.6% (2 out of 30) had a degree, 20% (6 out of 30) had GCSEs/Olevels/GCEs 10% (3 out of 30) had an HND/HNC, 6.6% (2 out of 30) responded other, 20% (6 out of 30) had no qualifications and 3.3% (1 out of 30) gave no response.

The crosstabulation of these variables seems to suggest that there is a relationship between the patients education level and whether or not the patients artificial limb hamper their movement due to fit, (Chi – square = 25.765, significance = 0.02), this suggests a 98% confidence of a relationship between the two variables.

Although only 16 out of 60 patients that responded yes their artificial limb does hamper their movement, this may be counted as an unacceptable percentage. This variable may imply that the reasoning behind this is due to the patients ability to adequately communicate with the prosthetist, as a result, failing to describe fit problems which may hamper their mobility if not addressed and corrected.
Additionally the educational level achieved by the patient may be as a result of their limited mobility. Meaning that the patient who has good mobility during or became disabled after their educational years 3-16 may have had a better chance at gaining higher educational levels, thus having increased communicative abilities.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(e) Derivation 5: Income level before becoming disabled.

(i) Tertiary Variable: How often do you need new artificial limbs?

The patients responses in conjunction to the two variables namely patients income before becoming disabled and the frequency by which they need new limbs are as follows.

Patients earning under £5,000 per annum. 5 out of 17 (29.4%) needed a new limb/s once a year, 4 out of 17 (23.5%) needed a new limb/s every two years, 5 out of 17 (29.4%) needed new limbs every five years, 1 out of 17 (5.8%) reported other and 2 (11.7%) did not respond.

Patients earning between £5,000 to £9,900 per annum. 33.3% (3 out of 9) needed a new limb/s once a year, 11.1% (1 out of 9) needed a new limb/s every two years,
11.1% (1 out of 9) needed new limbs every five years and 44.4% (4 out of 9) did not respond.

Patients earning between £10,000 to £14,999 per annum. 3 out of 11 (27.2%) needed a new limb/s every two years, 4 out of 11 (36.3%) needed new limbs every five years, 3 out of 11 (27.2%) reported other and 1 out of 11 (9%) did not respond.

Patients earning between £15,000 to £19,999 per annum. 50% (5 out of 10) needed a new limb/s every two years, 40% (4 out of 10) needed new limbs every five years and 10% (1 out of 10) did not respond.

Patients earning between £20,000 to £29,999 per annum. 1 out of 7 (14.2%) needed a new limb/s once a year, 4 out of 7 (57.1%) needed a new limb/s every two years, 1 out of 7 (14.2%) needed new limbs every five years and 1 out of 7 (14.2%) did not respond.

Patients earning between £30,000 to £39,999 per annum. 66.6% (2 out of 3) needed a new limb/s once a year and 33.3% (1 out of 3) needed new limbs every five years.

The correlation of these variables suggests that there is a association between the variables (Chi – square = 34.283, significance = 0.08), this suggests a 92% confidence of a relationship between the two variables.

This relationship may suggest that there is a link between the frequency of limb replacement and the patients income before becoming an amputee. This variable may
suggest that the longer the duration between the replacement of the patients prosthetic may improve their chance of increasing their earnings.

Furthermore the higher the patients earnings before amputation seems to have an impact on the frequency of limb replacement. Since all patients questioned were NHS patients and therefore under the same prescribing protocols, it is fair the suggest that the patients lifestyle and health levels may have an impact on the time between replacement prosthetics being required.

Secondly the income of the patient before becoming disabled may be an indicator of their lifestyle including their jobs and eating/socialising habits. This may infer that the patients with lower incomes may have worked in environments or careers that are more likely to result in illness or amputation, such as heavy industry. Additionally their earnings from and lifestyles associated with this form of career may suggest impacting factors. Including that their diets were affected being high fat, low nutritional food content or that they were more inclined to partake in drinking alcohol or smoking, both indicators of conditions such as arterial disease which are associated with limb loss.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.
(ii) Tertiary Variable: How long does it take to fit you with a new artificial limb/s, in appointments?

Patients earning under £5,000 per annum before becoming disabled. 2 out of 17 (11.7%) took 2 appointments to be fitted with a new limb/s, 8 out of 17 (47%) took 3 appointments to be fitted with a new limb/s, 4 out of 17 (23.5%) took 4 appointments to be fitted with a new limb/s, 1 out of 17 (5.8%) took 6 appointments to be fitted with a new limb/s, and 2 out of 17 (11.7%) did not respond to the question.

Patients earning between £5,000 to £9,900 per annum before becoming disabled. 22.2% (2 out of 9) took 2 appointments to be fitted with a new limb/s, 11.1% (1 out of 9) took 3 appointments to be fitted with a new limb/s, 11.1% (1 out of 9) took 4 appointments to be fitted with a new limb/s, 11.1% (1 out of 9) took 5 appointments to be fitted with a new limb/s, 11.1% (1 out of 9) took more than 11 appointments to be fitted with a new limb/s, and 33.3% (3 out of 9) did not respond to the question.

Patients earning between £10,000 to £14,999 per annum before becoming disabled. 1 out of 11 (9%) took 2 appointments to be fitted with a new limb/s, 5 out of 11 (45.4%) took 3 appointments to be fitted with a new limb/s and 3 out of 11 (27.2%) took more than 11 appointments to be fitted with a new limb/s.

Patients earning between £15,000 to £19,999 per annum before becoming disabled.
30% (3 out of 10) took 2 appointments to be fitted with a new limb/s, 30% (3 out of 10) took 3 appointments to be fitted with a new limb/s, 30% (3 out of 10) took 4 appointments to be fitted with a new limb/s, and 10% (1 out of 10) did not respond to the question.

Patients earning between £20,000 to £29,999 per annum before becoming disabled. 3 out of 7 (42.8%) took 3 appointments to be fitted with a new limb/s, 3 out of 7 (28.5%) took 6 appointments to be fitted with a new limb/s, 1 out of 7 (14.2%) took 8 appointments to be fitted with a new limb/s, and 1 out of 7 (14.2%) did not respond to the question.

Patients earning between £30,000 to £39,999 per annum before becoming disabled. 33.3% (1 out of 3) took 2 appointments to be fitted with a new limb/s and 66.6% (2 out of 3) took 4 appointments to be fitted with a new limb/s.

1 out of 3 (33.3) of patients that gave no indication of their annual income before becoming disabled responded that it took 3 appointments to be fitted with a new limb/s, 1 out of 3 (66.6%) took 7 appointments to be fitted with a new limb/s and 1 out of 3 (33.3%) did not respond to any category.

Variables relating to patients annual income prior to becoming disabled and the number of appointments that it takes to fit a new artificial limb seem to suggest that there is a relationship (Chi – square = 72.671, significance = 0.01). This suggests a 99% confidence of a relationship between the two variables.
This relationship may suggest that there is a link between the number of appointments taken to receive a new prosthesis and the patients income level before amputation. That is the number of appointments taken to receive a new prosthetic may have an adverse impact on the patients ability to earn and progress within their chosen career. Therefore the patient may find that their earnings will not increase. Additionally being a disabled person may also impact these factors.

Due to the relationship between these two variables being under 0.00 or 100% confidence of an association as required for this study, this variable was not considered as significant and was not subjected to any non-parametric tests.

(f) Derivation 6: Amputation Level (Which limb/s did you lose?)

(i) Tertiary Variable: Age at time of limb loss.

2 out of 60 (3.3%) patients indicated that they lost their right leg below knee before the age of 10 or as a result of a congenital birth defect were born with the limb absence.

Between the ages of 11 to 20, 33.3% (4 out of 12) patients indicated that they had lost their right leg below knee. 16.6% (2 out of 12) patients indicated that they had lost their left leg above knee. 33.3% (4 out of 12) patients indicated that they had lost their right leg above knee and 16.6% (2 out of 12) patients indicated that they had lost both legs below knee.
Between the ages of 21 to 30, 2 out of 60 (3.3%) of patients indicated that they had lost their right leg above knee. Between the ages of 31 to 40, 50% (2 out of 2) patients indicated that they had lost their left leg below knee and 50% (2 out of 4) patients indicated that they had lost their left leg above knee. Between the ages of 41 to 50, 2 out of 60 (3.3%) of patients indicated that they had lost their left leg below knee.

Between the ages of 51 to 60, 4 out of 12 (33.3%) patients indicated that they had lost their left leg below knee. 2 out of 12 (16.6%) patients indicated that they had lost their right leg below knee and 6 out of 12 (50%) patients indicated that they had lost their left leg above knee.

Between the ages of 61 to 70, 20% (2 out of 10) patients indicated that they had lost their left leg above knee. 40% (4 out of 10) patients indicated that they had lost their right leg below knee and 40% (4 out of 10) patients indicated that they had lost their left leg above knee.

Between the ages of 71 to 80, 2 out of 6 (33.3%) patients indicated that they had lost their left leg below knee. 2 out of 6 (33.3%) patients indicated that they had lost their right leg below knee and 2 out of 6 (33.3%) patients indicated that they had lost their left leg above knee.

Between the ages of 81 to 100, 40% (4 out of 10) patients indicated that they had lost their left leg below knee. 40% (4 out of 10) patients indicated that they had lost their right leg below knee and 20% (2 out of 10) patients indicated that they had lost their right leg above knee.
The suggested relationship between the variables of amputation level (which limb did you lose and age ($\chi^2 = 52.779$, significance $= 0.01$), this suggests a 99% confidence of a relationship between the two variables.

This variable may suggest that the patients' opinion of the fit of their prosthetic may be impacted by the age at which they lost their limb. Suggesting that it is easier for the person who loses their limb earlier in life to adjust to their situation, than those who loose them in later life. This may be as a result of the patient who has been disabled longer having a greater understanding of the limb fitting process and therefore are able to converse with the prosthetist in a more concise manner when describing problems, such as issues of fit. Additionally this may also be true for the patients psychological viewpoint, as it is often easier for a younger person to adjust to a new situation than an older person.

The patients satisfaction in connection to the fit of the prosthetic may also be effected by the amputees energy expenditure, with the older amputee being less able to physically compensate to increased energy usage when wearing the prosthetic. This may also be true with respect of the level of amputation as the greater the degree of limb loss may also increase the energy expenditure.

This variable was not subjected to any non-parametric tests, due to its statistical significance being under 0.00 or 100% confidence of an association between the two variables, as required for this study. As such this variable was not considered to have sufficient statistical relevance for non-parametric testing or further examination.
(ii) Tertiary Variable: Does your artificial limb hamper your movement due your own limitations?

The data gained from this question are as follows. A total of 22 out of 60 (36.6%) responded yes, that their own limitations hampered their movement, their corresponding levels of amputation follows. 10 out of 22 (45.4%) lost their left leg below knee, 5 out of 22 (22.7%) lost their right leg below knee, 3 out of 22 (13.6%) lost their left leg above knee and 4 out of 22 (18.1%) lost their right leg above knee.

41.6% (25 out of 60) patients responded no, their own limitations did not hamper their movement, their corresponding levels of amputation follows. 16% (4 out of 25) lost their left leg below knee, 35% (9 out of 25) lost their right leg below knee, 32% (8 out of 25) lost their left leg above knee and 12% (3 out of 25) lost their right leg above knee and 4% (1 out of 25) lost both legs below knee. Finally, 13 out of 60 (21.6%) patients did not respond.

These results seem to suggest an association between the patients own limitations and their which limb they lost (Chi – square = 14.245, significance = 0.07), this suggests a 93% confidence of a relationship between the two variables.

From this data it may be suggested that the fit of the prosthetic hampers the patients movement due to their own limitations several ways. Including the higher the level of amputation the more restricted the patient may be in accessing social, educational or work based environments. Additionally there may be, as indicated by other variables,
associations with the patients energy expenditure and their level of satisfaction this is
due to greater levels of amputation increasing levels of patient fatigue.

Furthermore the patients own limitations could impact the perceived fit of the
prostheses due to concomitant problems such as breathing difficulties, cardiovascular
disease or even just the age of the amputee and the attributed frailties.

Due to the relationship between these two variables being under the required 0.00 or
100%, this variable was not considered to have sufficient statistical relevance required
for this study and was not subjected to the non-parametric tests or further
examination.

(iii) Tertiary Variable: Within the socket what type of fit do you prefer?

In response to this question, patients who have lost their left leg below knee expressed
their desired fit in the following ways 2 out of 14 (14.2%) preferred movement, 9 out
of 14 (64.2%) preferred a close fit and 3 out of 14 (21.4%) didn’t know.

Patients who have lost their right leg below knee expressed their desired fit in the
following ways 10% (2 out of 20) preferred movement, 65% (13 out of 20) preferred
a close fit and 5% (1 out of 20) didn’t know.

13 out of 16 (81.2%) of patients who have lost their left leg above knee expressed that
they desired a close fit and 18.7% (3 out of 16) did not respond.
37.5% (3 out of 8) of patients who have lost their right leg above knee expressed that they desired a movement and 62.5% (5 out of 8) preferred a close fit. Finally 2 out of 60 (3.3%) of patients who lost both legs below knee preferred a close fit.

The suggested association between the patients preferred fit within the prosthetic limb and their level of amputation is (Chi – square = 18.625, significance = 0.09), this suggests a 91% confidence of a relationship between the two variables.

This relationship may suggest that if the fit of the prosthetic does not satisfy the patients requirements, satisfaction with the fit is impaired. The variable also implies that it is within the best interest of the prosthetist to achieve a close level of fit for all amputees regardless of their amputation level. This can be deduced as 66% of all respondents regardless of their amputation level indicated that they preferred a close fit within their prosthetic.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(g) Derivation 7 : Income level since becoming disabled.

(i) Tertiary Variable : Why do you take off your artificial limb?

The patients responses in conjunction to the two variables namely patients income since becoming disabled and the reasons for them removing their prosthesis, follows.
75% (45 out of 60) of the total patients questioned only removed their prosthesis to go to bed, they indicated their incomes in the following ways. 6 out of 45 (13.3%) earn less than £5000 per annum. 9 out of 45 (20%) earn between £5000 to £9,900 per annum. 7 out of 45 (15.5%) earn between £10,000 to £14,999 per annum. 5 out of 45 (11.1%) earn between £15,000 to £19,999 per annum. 11 out of 45 (24.4%) earn between £20,000 to £29,999 per annum. 1 out of 45 (2.2%) earn between £30,000 to £39,999 per annum. 2 out of 45 (4.4%) earn between £40,000 to £49,999 per annum. 1 out of 45 (2.2%) earns over £60,000 to 3 out of 45 (6.6%) did not respond.

7 out of 60 (11.6%) of the total patients that removed their prosthesis due to soreness and pain reported their incomes in the following ways. 2.2% (1 out of 45) earn less than £5000 per annum. 2.2% (1 out of 45) earn between £5000 to £9,900 per annum. 4.4% (2 out of 45) earn between £10,000 to £14,999 per annum. 4.4% (2 out of 45) earn between £15,000 to £19,999 per annum and 2.2% (1 out of 45) earn between £20,000 to £29,999 per annum.

2 patients out of 60 (3.3%) indicated that they removed their prosthesis to use the toilet, both respondents earn between £5000 to £9,900 per annum. 1.6% (1 out of 60) reported that the removed their prosthesis to change their socks due to excessive perspiration, they reported their income as being between £30,000 to £39,999 per annum and 5 out of 60 (8.3%) did not respond.
The correlation of these variables suggests that there is a relationship between the variables (Chi – square = 49.225, significance = 0.02), this suggests a 98% confidence of a relationship between the two variables.

Although the number of patients that remove their prosthetics for reasons other than to go to bed is relatively small being 9 out of 60 or 15%. It can it is fair to assume that the patients income may have been affected, in terms of their career progression and associated income increase. This is may be due to patient having the reported soreness or pain due to unsatisfactorily fitting prostheses.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(ii) Tertiary Variable: Do you wear clean stump socks every time you put your prosthesis on?

Patients responded in the following ways. 28 out of 60 (46.6%) of the total patients responded yes, they did use clean socks every time they put on their prosthesis, their incomes were reported in the following ways. 25% (7 out of 28) earn less than £5000 per annum. 21.4% (6 out of 28) earn between £5000 to £9,900 per annum. 10.7% (3 out of 28) earn between £10,000 to £14,999 per annum. 7.1% (2 out of 28) earn between £15,000 to £19,999 per annum. 25% (7 out of 28) earn between £20,000 to
£29,999 per annum. 3.5% (1 out of 28) earn between £4,000 to £49,999 per annum and 7.1% (2 out of 28) did not respond.

36.6% (22 out of 60) of the total patients questioned responded no, they did not use clean socks every time they put on their prosthesis, their incomes were reported in the following ways.

1 out of 22 (4.5%) earn less than £5000 per annum. 5 out of 22 (22.5%) earn between £5000 to £9,900 per annum. 7 out of 22 (31.8%) earn between £10,000 to £14,999 per annum. 4 out of 22 (18.8%) earn between £15,000 to £19,999 per annum. 3 out of 22 (24.4%) earn between £20,000 to £29,999 per annum. 1 out of 22 (4.5%) earn between £30,000 to £39,999 per annum and 2 out of 22 (9%) did not respond.

10% (6 out of 60) of patients did not know if they used clean socks every day and 4 out of 60 (6.6%) did not respond to the question.

The variables of using clean socks every time the patient put on their prosthesis and their income level since amputation suggests the following relationship (Chi – square = 36.884, significance = 0.04), this suggests a 96% confidence of a relationship between the two variables.

This relationship may suggest that patients who wear clean socks every time they put on their prosthetics are more likely to be satisfied with the fit of their prosthetics. This may be as a result, of the clean socks reducing the chance of infection or due to the cushioning nature of the clean sock on the stump within the prosthetic. However the
appears to be no direct relationship between the income of the patient and whether or not they have clean socks every day. Additionally as stump socks are given free of charge to the patient through the National Health Service there seems to be little reason for a connection between the two variables.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(h) Derivation 8 : Occupation before becoming disabled.

(i) Tertiary Variable : How long does it take to fit you with a new artificial limb/s, in appointments?

Patients who were self employed prior to their limb loss reported that it took the following number of appointments to fit them with a prosthetic limb. 1 out of 4 (25%) reported that it took 2 appointments. 2 out of 4 (50%) reported that it took 3 appointments and 1 out of 4 (25%) reported that it took 6 appointments.

Patients who were manual workers prior to their limb loss reported that it took the following number of appointments to fit them with a prosthetic limb. 22.2% (2 out of 9) reported that it took 2 appointments. 33.3% (3 out of 9) reported that it took 3 appointments. 22.2% (2 out of 9) reported that it took 4 appointments and 2 did not respond.
Patients who described their occupation as professional prior to their limb loss reported that it took the following number of appointments to fit them with a prosthetic limb. 1 out of 2 (50%) reported that it took 3 appointments and 1 out of 2 (50%) reported that it took 8 appointments.

Patients who were students prior to their limb loss reported that it took the following number of appointments to fit them with a prosthetic limb. 25% (3 out of 12) reported that it took 2 appointments. 41.6% (5 out of 12) reported that it took 3 appointments and 33.3% (4 out of 12) reported that it took 4 appointments.

Patients who described themselves as retired prior to their limb loss reported that it took the following number of appointments to fit them with a prosthetic limb. 1 out of 14 (7.1%) reported that it took 2 appointments. 3 out of 14 (21.4%) reported that it took 3 appointments. 1 out of 14 (7.1%) reported that it took 4 appointments. 1 out of 14 (7.1%) reported that it took 5 appointments. 2 out of 14 (14.2%) reported that it took more than 11 appointments and 6 did not respond.

Patients who described themselves managers prior to their limb loss reported that it took the following number of appointments to fit them with a prosthetic limb. 33.3% (1 out of 3) reported that it took 2 appointments. 33.3% (1 out of 3) reported that it took 4 appointments and 33.3% (1 out of 3) reported that it took 7 appointments.

Patients who described themselves as a skilled worker/trade prior to their limb loss reported that it took the following number of appointments to fit them with a prosthetic limb. 1 out of 4 (25%) reported that it took 3 appointments. 2 out of 4
(50%) reported that it took 4 appointments and 1 out of 4 (25%) reported that it took more than 11 appointments.

Patients who described themselves as an office worker prior to their limb loss reported that it took the following number of appointments to fit them with a prosthetic limb. 50% (2 out of 4) reported that it took 3 appointments. 25% (1 out of 4) reported that it took more than 11 appointments and 1 did not respond.

Finally 2 out of 60 patients (3.3%) who described themselves as working in the armed forces prior to their limb loss reported that it took 3 appointments to fit them with a prosthetic limb.

The crosstabulation of these variables seems to suggest that there is a relationship between the patients occupation before limb loss and the number of appointments that it takes to fit them with a new prosthetic (Chi – square = 103.657, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables, therefore it was subjected to the non-parametric tests (Kendall tau-b = .13 ) and (Spearman’s roe = .17 ) which will be discussed in chapter 8.

(ii) Tertiary Variable: How long are you able to walk in a normal day?

The 10% of the total patients (6 out of 60) who responded that they were unable to walk at all, had the following occupations prior to their limb loss. 16.6% (1 out of 6) was self employed. 16.6% (1 out of 6) was a manual worker. 50% (1 out of 6) was retired and 16.1% (1 out of 6) was a skilled worker/trade.
9 out of 60 (15%) of the total patients responded that they could walk between 5 to 10 minutes per day. 1 out of 9 (11.1%) was self employed. 1 out of 9 (11.1%) was a student. 2 out of 9 (22.2%) were retired. 2 out of 9 (22.2%) were skilled worker/trade. 1 out of 9 (11.1%) was an office worker and 2 out of 9 (22.2%) were public sector worker.

The 6.6% of the total patients (4 out of 60) who responded that they could walk between 11 to 30 minutes per day. 16.6% (1 out of 6) was self employed. 16.6% (1 out of 6) was a manual worker. 50% (1 out of 6) was retired and 16.1% (1 out of 6) was a skilled worker/trade.

8 out of 60 (13.3%) of the total patients responded that they could walk between 31 minutes to 1 hour per day. 2 out of 8 (25%) were manual workers 2 out of 8 (25%) were a professionals 2 out of 8 (25%) were retired and 2 out of 8 (25%) were office worker.

The 10% of the total patients (6 out of 60) who responded that they could walk between 2 to 4 hours per day. 33.3% (2 out of 6) were self employed. 50% (3 out of 6) were students and 16.6% (1 out of 6) was a public sector worker.

The 13.3% of the total patients (8 out of 60) who responded that they could walk between 5 to 8 hours per day. 2 out of 8 (25%) were students. 2 out of 8 (25%) were professionals 3 out of 8 (37.5%) were managers and 1 out of 8 (12.5%) was an office
worker. The 1.6% of the total patients (1 out of 60) who responded that they could walk between 9 to 13 hours per day worked within the armed forces.

The 23.3% of the total patients (14 out of 60) who responded that they could walk all day. 2 out of 14 (28.5%) were manual workers. 6 out of 14 (42.8%) were students. 1 out of 14 (7.1%) were skilled workers/trade. 2 out of 14 (28.5%) were public sector workers and 1 out of 14 (7.1%) worked within the armed forces. Finally, a total of 4 out of 60 (6.6%) patients did not respond to the question.

These two variables suggest the following relationship (Chi - square = 125.248, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables, therefore it was subjected to the non-parametric tests (Kendall tau-b = -.09) and (Spearman’s roe = -.13) which will be discussed in chapter 8.

(i) Derivation 9: Occupation since becoming disabled.

(i) Tertiary Variable: Reason for limb loss?

The following illustrates the occupations of patients since limb loss compared with the reason for their limb loss. The occupations of the 13.3% (8 out of 60) of patients that lost their limb/s through an accident as follows. 2 out of 8 (25%) were manual workers. 1 out of 8 (12.5%) was a shop worker. 1 out of 8 (12.5%) was a professional. 2 out of 8 (25%) were retired. 1 out of 8 (12.5%) was a skilled worker/trade and 1 out of 8 (12.5%) was a homemaker.
The occupations of the 53.3% (32 out of 60) of patients that lost their limb/s through an illness is as follows. 3.1% (1 out of 32) was self employed. 3.1% (1 out of 32) was a manual worker. 6.2% (2 out of 32) were professionals. 6.2% (2 out of 32) were students.

56.2% (18 out of 32) were retired. 3.1% (1 out of 32) was a manager. 9.3% (3 out of 32) were skilled workers/trade. 9.3% (3 out of 32) were office workers and 3.1% (1 out of 32) was a homemaker.

The occupations of the 6.6% (4 out of 60) of patients that was born with congenital limb loss (since birth) is as follows. 2 out of 4 (50%) were students. 1 out of 4 (25%) was a student and 1 out of 4 (25%) was an office worker.

The occupations of the 10 out of 60 (16.6%) patients that indicated that they lost their limb/s through a reason other than categorized. 10% (1 out of 10) was a director. 10% (1 out of 10) was self employed. 20% (2 out of 10) were professionals. 30% (3 out of 10) were retired. 10% (1 out of 10) was an office workers and 20% (2 out of 10) were public sector workers.

The occupations of the 10% (6 out of 60) of patients that lost their limb/s as a result of war. 16.6% (1 out of 6) was self employed. 16.6% (1 out of 6) was a manual worker. 16.6% (1 out of 6) was a shop worker. 16.6% (1 out of 6) was a professional. 16.6% (1 out of 6) was retired and 16.6% (1 out of 6) were skilled workers/trade.
This data seems to suggest a relationship between the variables (Chi - square = 57.891, significance = 0.07), this suggests a 93% confidence of a relationship between the two variables.

This variable may suggest that the most common reason for limb loss is an accident and that it is no more likely to effect one employment group than the other.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

7.5 **Main Variable 2 : Comfort**

(a) Derivation 1 : Patient location in conjunction with tertiary variables.

(i) Tertiary Variable : Does your artificial limb hamper your movement due to design?

13 out of 60 (21.6%) in total of patients attending both Leicester NHS Trust and the Luton & Dunstable NHS Trust responded, Yes that the design of their artificial limb hampered their movement. That is, 23.3% (7 out of 30) in Leicester NHS Trust and 20% (6 out of 30) in the Luton & Dunstable NHS Trust.

17 out of 30 (66.6%) in Leicester NHS Trust and 13 out of 30 (40%) in the Luton & Dunstable NHS Trust responded NO that the Design of their prosthesis did not
hamper their movement, a total of 30 out of 60 (50%). 15 out of 60 (25%) in
toichi of 60 (50%). 15 out of 60 (25%) in
attendance to both hospitals did not respond to the question.

This data suggests that in addition to comfort there may be other issues affecting
attendances to both hospitals did not respond to the question.

This data suggests that in addition to comfort there may be other issues affecting
patients, satisfaction with their prosthesis (Chi – square = 7.477, significance = 0.02),
this suggests a 98% confidence of a relationship between the two variables.

This relationship suggests that there is a relationship between patients satisfaction
with respect to the comfort of their prosthetic and the design of the prosthetics
supplied by the limb fitting centre. This implies that there is a more significant
variable impacting patients satisfaction with the comfort of their prostheses.

Due to the relationship between these two variables being under the required 0.00 or
100%, this variable was not considered to have sufficient statistical relevance required
for this study and was not subjected to the non-parametric tests or further
examination.

(ii) Tertiary Variable: Do you feel you walk well in your artificial limb/s? If no is
it due to type of amputation?

In addition to the question do you feel you walk well in your artificial limb? This
question was aimed at identifying the reasons behind possible problems behind the
patient not walking well in their prostheses, the results are as follows. 10% of the
patients (3 out of 30) in Leicester NHS Trust and 3.3% of the patients (10 out of 30)
in the Luton & Dunstable NHS Trust indicated that the amputation type was the
reason for feeling that they did not walk well in their artificial limb. That's 13 out of 60 (21.6%). The suggested association between these two variables is (Chi – square = 4.812, significance = 0.02), this indicates a 98% confidence of a relationship between the two variables.

This variable suggests that many patients felt that they did not walk well in their prostheses due to the type of amputation they had. This may indicate that the prescribed prosthetic was not suitable to the patient or that they had other problems not associated to the prosthetic, such as sores and abrasions.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(b) Derivation 2: Patient Gender

(i) Tertiary Variable: What was the reason for limb loss, If since birth what was the prognosis?

This question was asked in order to establish if there was an impact on the level of comfort and therefore prosthesis satisfaction if the patient was disabled through congenital limb deficiency. The results are as follows.

2 males out of 42 (4.7%) responded that they had lost their limb due to cancer prior to birth. 2 males out of 42 (4.7%) responded that they had lost their limb due to arterial
blockages prior to birth. 2 females out of 18 (11.1%) responded that they lost their limbs as a result of spina bifida prior to birth and 2 females out of 18 (11.1%) responded other.

The question was irrelevant to 52 out of 60 (86.6%) of patients as they had become disabled as a result of an accident, illness, was or an unspecified incident. This suggests an association between these two variables (Chi – square = 11.282, significance = 0.02), indicating a 98% confidence of a relationship between the two variables.

This variable may suggest that the comfort of the prostheses to a patient that has been born with limb abnormality or who had an amputation soon after birth may be of greater satisfaction. This inference it may be said is gender biased as equal number of respondents were male and female.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(ii) Tertiary Variable: Do you participate in the following type of activity—Shopping?

This question was asked to access the patients ability to do a pursuit such as shopping, that necessitates a continued and often prolonged level of mild activity. It must be
remembered that not all of the patients questioned participated in shopping of any type.

However the responses may suggest that prolonged activity levels are only attainable to a small number of the population questioned. This in connection with the literatures indicators of prosthetic comfort levels, measured in terms of activity duration, the comfort of the patients prosthetic may result in their inability to undertake such an activity as shopping. The results are as follows.

40.4% of Males (17 out of 42) and 72.2% of females (13 out of 18) indicated that they participated in shopping of one kind or another. 27 out of 60 (45%) in total indicated that they did not participate in the activity of shopping and 3 out of 60 (5%) did not respond. These two variables association is (Chi – square = 5.520, significance = 0.06), this suggests a 94% confidence of a relationship between the two variables.

This relationship may suggest that it is difficult for many of the respondents to participate in shopping due to the insufficient levels of prostheses comfort necessary to conduct such a pursuit. Additionally it may be inferred that female amputees are more able to actively shop than males, due to the suggestion that their prosthetics are more comfortable than the males prostheses.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.
(iii) Tertiary Variable: Do you have any problems with the fitting of your artificial limbs?

Although this question could be indicative of all the variables it was decided that it would be used to its best potential to indicate issues of comfort. The results are as follows.

33.3% (20 out of 60) of both males and females indicated that they had problems fitting their artificial limbs. This can be broken down as follows: 14 males out of 42 (33.3%) and 6 out of 18 (33.3%).

3 out of 42 (7.1%) males and 3 out of 18 (16.6%) females indicated that they sometimes had problems fitting their artificial limbs; this is a total of 6 out of 60 (10%).

30 out of 60 (50%) in total of both males and females indicated that they had no problems with the fitting of their artificial limbs; this can be broken down in the following way: 22 out of 42 (19%) males and 8 out of 18 (44.4%) females. Finally, 4 out of 60 (6.6%) or 3 out of 42 males (7.1%) and 1 out of 60 (5.5%) of females did not respond.

Although there seems to be little suggestion of an association between patient gender and whether they had problems with the fitting of their prosthetics, it is interesting that of the 26 out of 60 responded they either had or sometimes had problems. This
variable resulted in the following association (Chi – square = 1.349, significance = 0.70) this only suggests a 70% confidence of a relationship between the two variables.

These variables as already indicated have an extremely weak relationship, however the results imply that over half of the male and the female respondents suffer from comfort issues with their prostheses when being fitted with a replacement limb. This may be due to various factors including stump volume change, potential allergic reactions to materials, soreness or difficulties with the amputation type/level, when fitting.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(iv) Tertiary Variable: Do you have any problems with the fitting of your artificial limbs, and if so what?

In addition to the previous question patients were asked why they might have problems fitting their artificial limb, the responses are as follows. 12 out of 60 (20%) of both males and females indicated that they did not have any problems with the fitting of their prosthesis. 7.1% males (3 out of 42) and 5.5% of females (1 out of 18) indicated that it was difficult to get a good level of comfort due to the fit of the prosthesis. 3 out of 18 (16.6%) females said that their age gave them problems with respect to the fit of their prosthesis. 2.3 males (1 out of 42) indicated that they had
problems with the fitting of their artificial limbs as a result of poor limb fitters. 1 out of 42 males (2.3%) and 1 out of 18 (5.5%) indicated that they had a poorly fitted limb. 1 female out of 18 (5.5%) indicated that due to the varying size/volume of their stump they had difficulty with the fitting of their artificial limbs. 1 female out of 18 (5.5%) indicated that general wear and tear caused problems with the fitting of their limb and 26 out of 60 (43.3%) in total of both male and female did not reply to the question.

The suggested association between these two variables is (Chi – square = 13.968, significance = 0.05), this suggests a 95% confidence of a relationship between the two variables.

This result seems to suggest that the high number of both male and female patients 26 out of the total 60 that experience comfort issues when having a new prosthesis fitted suffer from some form of aliment which in their opinion affects the fitting process. Poor quality or ill fitting prostheses may create these aliments initially, but are exacerbated by the continuous fitting and wearing of prosthetics.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.
(c) Derivation 3 : Patient Age

(i) Tertiary Variable : Do you participate in the following type of activity – Sporting?

This question was asked to access the patients ability to pursue such activities that demand a higher level movement dynamics than those attributed to other activities such as shopping or socialising. Although the results of this question suggest a relationship between the variables of patients age and whether they participate in a sporting activity (Chi – square = 28.180, significance = 0.05) there is only a 95% confidence of a relationship between the two variables.

It must be anticipated and remembered that not all the patients questioned participate in sport, most often as a result of reasons other than their inability. However the results to this question are as follows.

1 patient out of 6 (16.6%) between the age of 31 to 40. 1 patient out of 6 (16.6%) between the age of 41 to 50. 3 patient out of 6 (50%) between the age of 51 to 60 and 1 patient out of 6 (16.6%) between the age of 81 to 100. Indicated that their disability limited the activities that they were able to participate in.

50% (2 patient out of 4) between the age of 61 to 70 and 50% (2 patient out of 4) between the age of 81 to 100 indicated that the reason behind their inability to participate in sporting activities was as a result of their reduced movement.
1 patient out of 3 (33.3%) between the age of 11 to 20. 1 patient out of 3 (33.3%) between the age of 41 to 50 and 1 patient out of 3 (33.3%) between the age of 51 to 60, indicated that their inability to run in their prosthesis restricted their sporting activities.

In total 21.6% of patients (13 out of 60) indicated that being disabled in one sense or another limited their ability to participate in sporting activities of any kind.

This variable suggests that a large number of respondents of all ages found it difficult to participate in any kind of sporting activity. In addition to the respondents’ statements, this difficulty may be as a result of the increased energy expenditure and levels of prosthetic comfort needed to undertake these activities.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(ii) Tertiary Variable: Does your artificial limb affect your stump?

10% (6 out of 60) in total indicated that they perspired profusely while using the prosthesis, their age groups were as follows. 16.6% (1 out of 6) were between the ages of 11 to 20. 16.6% (1 out of 6) were between the ages of 31 to 40. 16.6% (1 out of 6) were between the ages of 41 to 50. 33.3% (2 out of 6) were between the ages of 51 to 60 and 16.6% (1 out of 6) were between the ages of 81 to 100.
1 patient out of 60 (1.6%) between the age of 41 to 50, indicated that they had an allergic reaction to their artificial limb. 10% (6 out of 60) in total stated that their prosthesis gave them sore spots while using the prosthesis, their age groups were as follows. 16.6% (1 out of 6) were between the ages of 41 to 50. 16.6% (1 out of 6) were between the ages of 51 to 60. 33.3% (2 out of 6) were between the ages of 71 to 80 and 33.3% (2 out of 6) were between the ages of 81 to 100.

1 patient out of 60 (1.6%) between the age of 81 to 100, indicated that they had an allergic reaction to their artificial limb. Finally 25% (15 out of 60) responded no their stump is not affected by their artificial limb and 31 out of 60 (51.6%) did not respond.

Although there was a low response rate to this question it is evident that there may be an association between the two variables of patient age and the effect of the prosthesis on their stump. (Chi – square = 44.392, significance = 0.04) suggests a 96% confidence of a relationship between the two variables.

This result seems to suggest that patients at all ages experience comfort issues in relation to their stump being affected by the artificial limb. This is largely attributed to ailments such as perspiration and sore spots etc. These issues may be resultant from poor quality or ill fitting prostheses alternatively they may be connected to allergic reactions experience by the patient who may have a low tolerance to the glues, plastics and other materials used within the manufacture of the prosthetic socket.
Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(d) Derivation 4: Level of education

(i) Tertiary Variable: Does your artificial limb affect your stump?

The results are as follows. 1 patient educated to A level (1 out of 6 or 1.6%) and 5 patients with no formal education (5 out of 6 or 83.3%) responded that their prosthesis made them sweat profusely. 1 patient educated to HND/HNC level (1 out of 60 or 1.6%) indicated that their prosthesis gave them allergic reactions.

1 patient educated to grammar school level (1 out of 6 or 16.6%), 1 patient educated to degree level (1 out of 6 or 16.6%), 1 patient educated to level other than categorized (1 out of 6 or 16.6%), 2 patients with no formal education (2 out of 6 or 33.3%), and one (1 out of 6 or 16.6%) did not respond as to their level of education.

1 patient educated to grammar school level (1 out of 60 or 1.6%) indicated that the prosthesis made their residual stump shrink in size or in other words the volume of their stump was subject to change.

The association between the two variables being the education level of the patient and the effect if any the prosthesis has on their stump is (Chi – square = 54.371,
significance = 0.01), this suggests a 99% confidence of a relationship between the two variables.

This variable may suggest that the greater the education level of the patient the more likely they are to be able to inform the prosthetist about the comfort levels of their prosthetic, this therefore may effect whether or not the prosthetic affects their stump.

Additionally this may suggest that if the prosthetic does affect the patients stump, patients are less likely to have progressed through the educational system and indeed progress within their chosen careers.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(ii) Tertiary Variable : How long do you wear your artificial limbs for during a single day?

The 10 out of 60 (16.6%) patients who had a grammar school education responded in the following ways. 3 patients out of 10 (30%) wore there prosthesis for between 1 to 3 hours, 1 patient out of 10 (10%) wore there prosthesis for between 4 to 10 hours and 6 patients out of 10 (60%) wore there prosthesis all day or longer than 10 hours.
The 5 patients out of 60 (8.3%) with A levels responded thus. 1 patient out of 5 (20%) wore their prostheses for between 11 to 20 minutes, 1 patient out of 5 (20%) wore their prostheses for between 4 to 10 hours and 3 patients out of 5 (60%) wore their prostheses all day or longer than 10 hours.

10% (6 out of 60) of patients educated to degree level responded in the following ways. 1 patient out of 6 (16.6%) wore there prostheses for between 1 to 3 hours, 1 patient out of 6 (16.6%) wore there prostheses for between 4 to 10 hours and 4 patients out of 6 (66.6%) wore there prostheses all day or longer than 10 hours.

8 out of 60 (13.3%) of patients educated to GCSE/Olevel/GCE level and 5% (3 out of 60) of patients educated to HND/HNC level responded that they wore their artificial limb all day or longer than 10 hours.

5% (3 out of 60) of patients that indicated that they were educated to a level that was not categorized, wore their prostheses for the following duration’s. 33.3% (1 patient out of 3) indicated that they could wear their limb for between 5 to 10 minutes and (66.6%) 2 patients out of 3 indicated that they could wear their limb all day or longer than 10 hours.

The 20 out of 60 (33.3%) patient that reported they had no formal qualifications. Within this 1 out of 20 (5%) wore their prostheses between 4 to 10 hours, 16 out of 20 (80%) wore there prostheses all day or longer than 10 hours and 3 out of 20 (15%) gave no response. The remaining 5 out of 60 (8.3%) give no response.
The suggested significance of these two variables is (Chi – square = 52.978, significance = 0.02), this suggests a 98% confidence of a relationship.

It can be suggested through this variable that the length of time that a patient can wear their prosthetic within limitations of comfort may impact the patient potential to gain and progress their level of education. This is also a factor that can be considered in connection to the patients ability to access gainful employment as the level that the patient is educated to may restrict their employment opportunities.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(e) Derivation 5 : Income level before becoming disabled.

(i) Tertiary Variable : Age at the time of limb loss?

28.3% (17 out of 60) patients responding that they earned under £5,000 before becoming disabled were grouped in the following ages. 1 patient out of 17 (5.8%) was aged between 0 to 10. 6 patient out of 17 (35.2%) were aged between 11 to 20. 2 patient out of 17 (11.7%) were aged between 21 to 30. 1 patient out of 17 (5.8%) was aged between 31 to 41. 2 patient out of 17 (11.7%) were aged between 41 to 50. 1 patient out of 17 (5.8%) was aged between 51 to 60. 2 patient out of 17 (11.7%) were aged between 61 to 70. 1 patient out of 17 (5.8%) was aged between 71 to 80. 1 patient out of 17 (5.8%) was aged between 81 to 100.
9 out of 60 (15%) patients responded that they earned between £5,000 to £9,900, before becoming disabled. These patients were grouped according to the following ages. 22.2% (2 out of 9) of patients were aged between 11 to 20. 11.1% (1 out of 9) of patients were aged between 51 to 60. 33.3% (3 out of 9) of patients were aged between 61 to 70. 33.3% (3 out of 9) of patients were aged between 81 to 100.

18.3% (11 out of 60) patients responding that they earned between £10,000 to £14,999 before becoming disabled were grouped in the following ages. 1 patient out of 11 (9%) was aged between 0 to 10. 2 patient out of 11 (18.1%) were aged between 11 to 20. 1 patient out of 11 (9%) was aged between 51 to 60. 1 patient out of 11 (9%) was aged between 61 to 70. 2 patient out of 11 (18.1%) was aged between 71 to 80. 4 patient out of 11 (36.3%) was aged between 81 to 100.

10 out of 60 (16.6%) patients responded that they earned between £15,000 to £19,999, before becoming disabled. These patients were grouped according to the following ages. 20% (2 out of 10) of patients were aged between 11 to 20. 40% (4 out of 10) of patients were aged between 51 to 60. 10% (1 out of 10) of patients were aged between 61 to 70. 10% (1 out of 10) of patients were aged between 71 to 80. 10% (1 out of 10) of patients were aged between 81 to 100.

18.3% (11 out of 60) patients responding that they earned between £20,000 to £29,999 before becoming disabled were grouped in the following ages. 2 patient out of 7 (28.5%) was aged between 51 to 60. 2 patient out of 7 (28.5%) was aged between
61 to 70. 2 patient out of 7 (28.5%) was aged between 71 to 80. 1 patient out of 7 (14.2%) was aged between 81 to 100.

1 out of 60 (16.6%) patients responded that they earned between £30,000 to £39,999, was aged between 51 to 60. Finally 3 out of 60 (5%) of the patients did not respond to the question. Their age was grouped in the following ways. 2 patient out of 3 (66.6%) were aged between 31 to 40 and 1 patient out of 3 (33.3%) was aged between 61 to 70.

The suggested significance of these two variables is (Chi - square = 66.244, significance = 0.04) this suggests a 96% confidence of a relationship between the two variables.

It can be suggested through this variable that the comfort of the prosthetic may have a limiting effect on the patients ability to increase their earnings and progress within their careers following limb loss. Additionally this variable may imply that the age at which the patient becomes disabled has a direct relationship and effect on the patients standard of living. This it is speculated may be due to the possibility of the patient prior to becoming disabled having an established well-paid career, which could have provided for such an eventuality. This in turn could result in the patient having a more congenial lifestyle that would create better circumstances with lesser impact on prosthetic comfort, as opposed to a potentially physically demanding career.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required
for this study and was not subjected to the non-parametric tests or further examination.

(f) Derivation 6: Which limb did you lose?

(i) Tertiary Variable: Reason for limb loss?

Patients who have lost their left leg below knee reported the reason for limb loss in the following ways. 10 out of 14 (71.4%) indicated the causation to be an illness. 2 out of 14 (14.2%) to be as a result of war and 2 out of 14 (14.2%) indicated other.

Patients who have lost their right leg below knee reported the reason for limb loss in the following ways. 10% (2 out of 20) indicated the causation to be an accident. 40% (8 out of 20) indicated illness, 20% (4 out of 20) as a result of a congenital abnormality, 10% (2 out of 20) to be as a result of war and 10% (2 out of 20) indicated other.

Patients who have lost their left leg above knee reported the reason for limb loss in the following ways. 2 out of 16 (12.5%) indicated the causation to be an accident. 10 out of 16 (62.5%) indicated illness, 2 out of 16 (12.5%) to be as a result of war and 2 out of 16 (12.5%) indicated other.

Patients who have lost their right leg above knee reported the reason for limb loss in the following ways. 50% (4 out of 8) indicated the causation to be an accident and 50% (4 out of 8) indicated illness.
2 out of 60 patients (3.3%) who lost both their legs below knee reported the reason for limb loss as other.

The results of the two variables, the reasons for patient limb loss and the associated absent limb/s seem to suggest a relationship (Chi – square = 32.608, significance = 0.00) this suggests 100% confidence of a relationship between the two variables, therefore it was subjected to the non-parametric tests (Kendall tau-b = -.18) and (Spearman's rho = -.20) which will be discussed in chapter 8.

(ii) Tertiary Variable: How long does it take to fit you with a new artificial limb/s, in weeks?

Patients who have lost their left leg below knee responded that it took the following number of weeks to fit them with a new artificial limb. 4 out of 14 (28.5%) took 2 weeks, 2 out of 14 (14.2%) took 3 weeks, 2 out of 14 (14.2%) took 4 weeks, 2 out of 14 (14.2%) took 6 weeks, 1 out of 14 (7.1%) took 10 weeks, 2 out of 14 (14.2%) took more than 11 weeks and 1 out of 14 (7.1%) did not respond to the question.

Patients who have lost their right leg below knee responded that it took the following number of weeks to fit them with a new artificial limb. 30% (6 out of 20) took 3 weeks, 5% (1 out of 20) took 5 weeks, 30% (6 out of 20) took 6 weeks, 5% (1 out of 20) took more than 11 weeks, 5% (1 out of 20) responded that they did not know and 25% (5 out of 20) did not respond to the question.
Patients who have lost their left leg above knee responded that it took the following number of weeks to fit them with a new artificial limb. 1 out of 16 (6.2%) took 2 weeks, 6 out of 16 (37.5%) took 3 weeks, 2 out of 16 (12.5%) took 4 weeks, 1 out of 16 (6.2%) took 5 weeks, 2 out of 16 (12.5%) took 8 weeks, 1 out of 16 (6.2%) took more than 11 weeks, 3 out of 16 (18.7%) did not respond to the question.

Patients who have lost their right leg above knee responded that it took the following number of weeks to fit them with a new artificial limb. 12.5% (1 out of 8) took 2 weeks, 25% (2 out of 8) took 3 weeks, 12.5% (1 out of 8) took 4 weeks, 12.5% (1 out of 8) took 5 weeks, 12.5% (1 out of 8) took 6 weeks, 12.5% (1 out of 8) took more than 11 weeks and 12.5% (1 out of 20) responded that they did not know.

Patients who have lost both their legs below knee responded that it took the following number of weeks to fit them with a new artificial limb. 1 out of 2 (50%) took 3 weeks and 1 out of 2 (50%) took 10 weeks.

Variables association is (Chi – square = 48.283, significance = 0.08), this suggests a 92% confidence of a relationship between the two variables.

From the relationship between these two variables it can be suggested that the level of amputation may have an impact on the number of weeks required to fit a new prosthetic. This implies that the greater the level of amputation the longer it will take to fit a new prosthetic. This may be due to the problems associated with more complicated amputation, such as above knee or may be due to the problems associated with the factors involved with fitting a double or triple amputee, such as balance.
Additionally the age of the patient may impact the time that it takes to fit them with a new prosthetic as the rigours of the limb fitting process can often result in high levels of fatigue, which in turn can cause comfort problems.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(iii) Tertiary Variable: Does your artificial limb hamper your movement, due to its bad quality?

Patient responded in the following ways. 88.3% (53 out of 60) patients gave no response to the question, therefore it is reasonable to presume that these patients had no issues with the quality of their prosthesis.

However, 11.6% (7 out of 60) indicated that they felt that their movement was hampered as a result of the poor quality of their prosthesis, their individual level of amputation is as follows. 3 out of 7 (42.8%) had lost their left leg below knee, 1 out of 7 (14.2%) had lost their left leg above knee and 3 out of 7 (42.8%) had lost their right leg above knee.

This data seems to suggest that there are few cases of patients feeling that their prosthesis is of poor quality and reduces their movement. The relationship between
the variables is (Chi – square = 9.836, significance = 0.04), this suggests a 96% confidence of a relationship between the two variables.

It can be suggested through this variable that the reason behind the patients response being that bad quality prosthetics hamper their movement may be connected to the limb that was lost. That is that the severity of the limb loss or which limb is lost can create difficulties with the comfort and therefore movement of the patient. This may be caused by associated problems such as soreness or perspiration or could be attributed to the technology involved in manufacturing the prosthetic.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(g) Derivation 7 : Income level since becoming disabled.

(i) Tertiary Variable : How long does it take to fit you with a new artificial limb/s, in weeks?

Patients respond that their earnings since their amputation crosstabulated with the variable of the duration of the limb fitting process in weeks are as follows.

1 patient out of 10 (10%) earning under £5000 responded that it took 2 weeks to fit them with a new prosthesis, 2 patients out of 10 (20%) responded 3 weeks, 2 patients out of 10 (20%) responded 5 weeks, 2 patients out of 10 (20%) responded 6 weeks and 3 out of 10 (30%) did not respond.
23% of patients (3 out of 13) earning between £5000 to £9,900 responded that it took 2 weeks to fit them with a new prosthesis, 30.7% of patients (4 out of 13) responded 3 weeks, 7.6% of patients (1 out of 13) responded 4 weeks, 7.6% of patients (1 out of 13) responded 6 weeks, 7.6% of patients (1 out of 13) responded 10 weeks and 23% (3 out of 13) did not respond.

5 patients out of 10 (50%) earning between £10,000 to £14,999 responded that it took 3 weeks to fit them with a new prosthesis, 3 patients out of 10 (30%) responded that it took more than 11 weeks to fit them with a new prosthesis 1 patient out of 10 (10%) did not know and 1 out of 10 (10%) did not respond.

14.2% of patients (1 out of 7) earning between £15,000 to £19,999 responded that it took 2 weeks to fit them with a new prosthesis, 42.8% of patients (3 out of 7) responded 3 weeks, 14.2% of patients (1 out of 7) responded 4 weeks, 14.2% of patients (1 out of 7) responded that it took more than 4 weeks and 14.2% of patients (1 out of 7) did not know.

1 patient out of 12 (8.3%) earning between £20,000 to £29,999 responded that it took 2 weeks to fit them with a new prosthesis, 2 patients out of 12 (16.6%) responded 3 weeks, 1 patients out of 12 (8.3%) responded 4 weeks, 1 patients out of 12 (8.3%) responded 6 weeks, 2 patients out of 12 (16.6%) responded 8 weeks and 1 out of 12 (8.3%) did not respond.
50% of patients (1 out of 2) earning between £30,000 to £39,999 responded that it took 4 weeks to fit them with a new prosthesis and 50% of patients (1 out of 2) responded that it took 5 weeks.

1 patient out of 2 (50%) earning between £40,000 to £49,999 responded that it took 4 weeks to fit them with a new prosthesis and 1 patient out of 2 (50%) responded 5 weeks.

1.6 of patients (1 out of 60) earning over £60,000 responded that it took 10 weeks to fit them with a new prosthesis and 1 out of 60 (1.6%) did not respond.

The suggested relationship between the variables is (Chi – square = 105.862, significance = 0.00) indicating a 100% confidence of a relationship between the two variables therefore it was subjected to the non-parametric tests (Kendall tau-b =0.04 ) and (Spearman’s r = 0.05 ) which will be discussed in chapter 8.

(ii) Tertiary Variable : Would it be easier not to have stump socks and if so why?

2 patients out of 60 (3.3%) responded that they found the use of stump socks and inconvenience, 1 of which indicated that their earnings were under £5000 per annum and the other indicated earning between £10,000 to 14,999. 1 out of 60 (1.6%) indicated earning over £60,000 per annum and commented that stump socks were a problem as they found that their stump volume changed. 1 out of 60 (1.6%) who did not indicate their earnings commented that they found stump socks difficult to put on.
4 out of 60 (6.6%) responded no stump socks did not prove a problem and 52 out of 60 (86.6%) did not respond to this line of enquiry.

This variable although having a relatively small response rate indicates the following relationship between the variables (Chi – square = 94.885, significance = 0.00) this suggests a 100% confidence of a relationship between the two variables. This is based on the following results. Therefore it was subjected to the non-parametric tests (Kendall tau-b = -.16 ) and (Spearman’s roe = -.19 ) which will be discussed in chapter 8.

(h) Derivation 8 : Occupation before becoming disabled.

(i) Tertiary Variable : How long are you able to walk in a normal day?

The 10% of the total patients (6 out of 60) who responded that they were unable to walk at all had the following occupations prior to their limb loss. 16.6% (1 out of 6) was self employed. 16.6% (1 out of 6) was a manual worker. 50% (1 out of 6) was retired and 16.1 % (1 out of 6) was a skilled worker/trade.

9 out of 60 (15%) of the total patients responded that they could walk between 5 to 10 minutes per day. 1 out of 9 (11.1%) was self employed. 1 out of 9 (11.1%) was a student. 2 out of 9 (22.2%) were retired. 2 out of 9 (22.2%) were skilled worker/trade. 1 out of 9 (11.1%) was an office worker and 2 out of 9 (22.2%) were public sector worker.
The 6.6% of the total patients (4 out of 60) who responded that they could walk between 11 to 30 minutes per day. 16.6% (1 out of 6) was self employed. 16.6% (1 out of 6) was a manual worker. 50% (1 out of 6) was retired and 16.1% (1 out of 6) was a skilled worker/trade.

8 out of 60 (13.3%) of the total patients responded that they could walk between 31 minutes to 1 hour per day. 2 out of 8 (25%) were manual workers 2 out of 8 (25%) were a professionals 2 out of 8 (25%) were retired and 2 out of 8 (25%) were office worker.

The 10% of the total patients (6 out of 60) who responded that they could walk between 2 to 4 hours per day. 33.3% (2 out of 6) were self employed. 50% (3 out of 6) were students and 16.6% (1 out of 6) was a public sector worker.

The 13.3% of the total patients (8 out of 60) who responded that they could walk between 5 to 8 hours per day. 2 out of 8 (25%) were students. 2 out of 8 (25%) were professionals 3 out of 8 (37.5%) were managers and 1 out of 8 (12.5%) was an office worker.

The 1.6% of the total patients (1 out of 60) who responded that they could walk between 9 to 13 hours per day worked within the armed forces.

The 23.3% of the total patients (14 out of 60) who responded that they could walk All day. 2 out of 14 (28.5%) were manual workers. 6 out of 14 (42.8%) were students.
1 out of 14 (7.1%) were skilled workers/trade 2 out of 14 (28.5%) were public sector workers and 1 out of 14 (7.1%) worked within the armed forces. Finally a total of 4 out of 60 (6.6%) patients did not respond to the question.

These two variables suggest the following relationship (Chi – square = 125.248, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = -0.09) and (Spearman’s roe = -0.13) which will be discussed in chapter 8.

(i) Derivation 9: Occupation since becoming disabled.

(i) Tertiary Variable: Does your artificial limb affect your stump?

15 out of 60 (25%) in total indicated that they did not have any problems with their prosthesis in respect of it affecting their stump. However, 1 out of 6 (16.6%) who reported being self employed, 1 out of 6 (16.6%) a manual worker, 1 out of 6 (16.6%) a professional, 2 out of 6 (33.3%) students and 1 out of 6 (16.6%) an office worker, all indicated that their prosthesis affected their stump by making them perspire profusely.

1.6% (1 out of 60) indicated that they had an allergic reaction towards the prosthesis. 1 out of 6 (16.6%) who reported being self employed, 1 out of 6 (16.6%) a professional, 1 out of 6 (16.6%) a student, 2 out of 6 (33.3%) were retired, 1 out of 6 (16.6%) a manager and 1 out of 6 (16.6%) a skilled worker/trade, all indicated that their prosthesis affected their stump by making them sore.
1.6% (1 out of 60) a retired person indicated that their prosthesis affected their stump size. Finally 31 out of 60 (51.6%) failed to respond to the questioning.

Although there was a low response rate to this question it is evident that there may be an association between the two variables and the prosthesis effect on patient comfort (Chi – square = 69.446, significance = 0.09) this suggests 91% confidence of a relationship between the two variables.

This variable seems to suggest that 75% of respondents questioned experienced some form of discomfort with the stump as a result of their prosthetic, as a result it is fair to suggest that it is likely that their occupations since becoming disabled have been affected due to this discomfort. Discomfort as reported by the respondents may impact many areas of a persons life reducing mobility, increasing time at the limb fitting centre or hospital or even forcing a career change due to work demands becoming unattainable as a result of their disability.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(ii) Tertiary Variable : Is your artificial limb comfortable.

From the 32 patients out of 60 (53.3%) in total who responded yes that the fit of their artificial limb is comfortable their occupation since becoming disabled are as follows.
1 out of 32 (3.1%) was a director, 2 out of 32 (6.2%) were self employed, 3 out of 32 (9.3%) were manual workers, 1 out of 32 (3.1%) was a shop worker, 6 out of 32 (18.7%) were professionals, 3 out of 32 (9.3%) were students, 12 out of 32 (37.5%) were retired, 2 out of 32 (6.2%) were skilled workers/trade, 1 out of 32 (3.1%) was an office worker, and 1 out of 32 (3.1%) was a public sector worker.

From the 12 patients out of 60 (20%) in total who responded no that the fit of their artificial limb was not comfortable their occupation since becoming disabled are as follows. 8.3% (1 out of 12) was self employed, 8.3% (1 out of 12) was shop worker, 8.3% (1 out of 12) was retired, 16.6% (2 out of 12) were office workers and 16.6% (2 out of 12) were homemakers. 7 patients out of 60 (11.6%) in total responded other and 9 out of 60 (15%) did not respond.

Variables association (Chi – square = 69.446, significance = 0.09). This suggests a 91% confidence of a relationship between the two variables.

From this variable it can be suggested that many of the respondents are likely to be satisfied with their prosthetics due to the level of comfort that they have achieved during the limb fitting process. This may be due to the patients ability to communicate their needs, relaying accurately areas of discomfort and the degree.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.
7.6 **Main Variable 3 : Practicality**

(a) Derivation 1 : Patient location in conjunction with tertiary variables.

(i) Tertiary Variable : Has your disability ever limited your chances within the workplace?

60 out of 60 patients (100%) indicated that their disability had limited their chances in the workplace. Some of the respondents explained why, in the following ways.

3 out of 30 (10%) patients attending Luton & Dunstable NHS Trust responded that they had to retire as their disability resulted in their inability to work.

7 out of 30 patients (23.3%) attending Leicester NHS Trust and 1 out of 30 (3.3%) attending the Luton & Dunstable NHS Trust responded that they felt their career progression had been affected as a result of their disability and 49 out of 60 in total 9 (81.6%) did not indicate that they felt they had been affected in respects of the work place.

The significance of this question is the following (Chi – square = 7.684, significance = 0.02) This suggests a 98% confidence of a relationship between the two variables.

Although the relationship between the two variables is significant the number of respondents that indicated yes their careers were limited by their disability is relatively low. This may be as a result of the possible age at which the respondent became disabled that is that they possibly became disabled following their retirement.
Alternatively the respondents may feel that their disability was in no way a handicap to their career and that their prosthetic was practical.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(ii) Tertiary Variable: Has your disability ever limited your chances within sporting activities?

60 out of 60 patients (100%) indicated that their disability had limited their chances in sporting activities.

Some respondents explained why. 20% (6 out of 30) of patients attending Luton & Dunstable NHS Trust responded that they had to retire as their disability limited their activities. 13.3% (4 out of 30) of patients attending Luton & Dunstable NHS Trust responded that their reduced movement limited their sporting activities. 3.3% (1 out of 30) of patients attending Luton & Dunstable NHS Trust responded that they were unable to run.

The crosstabulation of these two variables indicates a significance (Chi – square = 16.596, significance = 0.00). This suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests
(Kendall $\tau-b = -0.50$) and (Spearman’s $\rho = -0.52$) which will be discussed in chapter 8.

(iii) Tertiary Variable: Does your artificial limb hamper your movement due to technology?

10 out of 60 (16.6%) in total of patients attending both Leicester NHS Trust and the Luton & Dunstable NHS Trust responded, Yes that the technology used in the prosthesis hampered their movement. This is illustrated in the following way. 4 out of 30 (13.3%) in total of patients attending Leicester NHS Trust and 6 out of 30 (20%) the Luton & Dunstable NHS Trust.

Patients that indicated no, 23 out of 30 (76.6%) in Leicester NHS Trust and 12 out of 30 (20%) in the Luton & Dunstable NHS Trust. 15 out of 60 (25%) did not respond.

The significance of these two variables being the location of the limb fitting centre in attendance and whether the patient felt that their prosthesis limited their movement due to the technology used in its construction is ($\chi^2 = 9.257$, significance = 0.01). This suggests a 99% confidence of a relationship between the two variables.

From this variable it can be suggested that some of the respondents feel that the practicality of their prosthetic is likely to be restricted due to the technology used in their construction. This may be due to the patients lack of knowledge with regards to the price of the equipment they use or a lack of understanding that the NHS has limited recourses. Alternatively a dominant number of respondents indicated that the technology used to make their prosthetic was not the cause of their limited movement.
Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(b) Derivation 2: Patient Gender.

(i) Tertiary Variable: how often do you need new artificial limbs?

Males responded in the following ways. 11 out of 42 (26.1%) responded once a year, 14 out of 42 (33.3%) responded every two years, 10 out of 42 (23.8%) responded every five years, 2 out of 42 (4.7%) responded other and 5 out of 42 (11.9%) did not respond.

Females responded in the following ways. 5.5% (1 out of 18) responded once a year, 16.6% (3 out of 18) responded every two years, 38.8% (7 out of 18) responded every five years, 16.6% (3 out of 18) responded other and 22.2% (4 out of 18) did not respond.

The relationship between these two variables is (Chi – square = 7.966, significance = 0.09). This variable suggests a 91% confidence of a relationship between the two variables. Although there is a statistical relationship this does not appear to have a bearing on this study, due to the relationship between these two variables being under the required 0.00 or 100%. Therefore this variable was not considered to have.
sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(ii) Tertiary Variable: How often do you wear your artificial limb/s?

Used twice this variable also indicated the frequency by which patients wear of their prosthesis thus indicating the practicality of the use. 40 males out of 42 (95.2) and 15 females out of 18 (83.3%) responded that they wore their prosthesis every day. No Males and 2 females out of 18 (11.1%) responded that they wore their prosthesis once or twice a week, while 2 males out of 42 (4.7%) and 1 female out of 18 (5.5%) did not respond to the question.

The crosstabulation of these variables seems to suggest that there is a relationship between the variables pertaining to the patients gender and how often they wear their prosthesis (Chi – square = 4.877, significance = 0.08) This suggests 92% confidence of a relationship between the two variables.

From this variable it can be suggested that the practicality of the prosthetic within the frequency of prosthetic use may be impacted by the patients gender. This may result in females being less inclined or able to wear their prosthetics than males, potentially due issues such as water retention at particular times of the month or energy expenditure while wearing a prosthetic.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required.
for this study and was not subjected to the non-parametric tests or further examination.

(c) Derivation 3 : Patient Age

(i) Tertiary Variable : How long does it take you to put on your artificial limb/s?

Crosstabulating between length of time that it takes a patient to put on their artificial limb and the patient's age resulted in the findings. 4 patients out of 60 (6.6%) aged between 11 to 20 indicated in the following ways. 1 patient took 3 minutes (25%), 1 patient took 5 minutes (25%), 1 patient took 15 minutes (25%) and 1 patient did not respond (25%).

2 patients out of 60 (3.3%) aged between 31 to 40 indicated in the following ways. 50% (1 patient) took 1 minute and 50% (1 patient) took 5 minutes. 4 patients out of 60 (6.6%) aged between 41 to 50 indicated in the following ways. 2 patients took 3 minutes (50%) and 2 patients took 5 minutes (50%).

14 patients out of 60 (23.3%) aged between 51 to 60 indicated in the following ways. 21.4% (3 patients) took 1 minute, 35.7% (5 patients) took 3 minutes, 28.5% (4 patients) took 5 minutes and 14.2% (2 patients) did not respond.

6 patients out of 60 (10%) aged between 61 to 70 indicated in the following ways. 3 patients took 1 minute (50%), 1 patient took 5 minutes (16.6%), 1 patient took 15 minutes (16.6%) and 1 patient (16.6%) did not respond.
16 patients out of 60 (26.6%) aged between 71 to 80 indicated in the following ways. 12.5% (2 patients) took 1 minute, 37.5% (6 patients) took 3 minutes, 12.5% (2 patients) took 5 minutes, 6.2% (1 patient) took 10 minutes, 18.7% (3 patients) took 15 minutes and 12.5% (2 patients) did not respond.

14 patients out of 60 (23.3%) aged between 81 to 100 indicated in the following ways. 2 patients (14.2%) took 1 minute, 4 patients (28.5%) took 3 minutes, 4 patients (28.5%) took 5 minutes, 1 patient (7.1%) took 15 minutes, 1 patient (7.1%) took 20 minutes, 1 patient (7.1%) did not know and 1 patient (7.1%) did not respond.

The significance of this question (Chi – square = 28.179, significance = 0.9) although a extremely low relationship of only 10% this variable suggest that the age of the patient has an effect on the time that is taken to put on their prosthetic. Suggesting that the older the patient the longer they take to don their limb. This may be due to age related weakness, the fact that they might be a new amputee that is likely to be inexperienced, or be due to other issues that affect their dexterity such as arthritis.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.
Tertiary Variable: (How long does it take you to put on your artificial limb/s?)

Why does it in your opinion take you longer than 5 minutes?

32 out of 60 (53.3%) of the total number of patients questioned did not respond to the question, however, 1 patient between the age of 11 to 21 indicated that putting on socks so many socks wasted time.

1 patient between 71 to 80 suggested that socks took time to put on correctly and 3 between 81 to 100 also suggested that socks took time to put on correctly.

1 patient between 41 to 50 found that hot whether made it more difficult for them to put on their prosthesis as their stump swelled and 2 patients between 71 to 80 were new amputees and therefore were not used to putting on their socks or prosthesis.

Although a low response rate was received to this question the association of (Chi-square = 44.996, significance = 0.03) this suggests 97% confidence of a relationship between the two variables. This variable suggests that some of the respondents find the use of prosthetic socks an issue that impacts practicality, for the reasons given above. This inference is purely conjectural, as this variable was not subjected to any non-parametric tests. Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.
(d) Derivation 4 : Level of education

(i) Tertiary Variable: Does your artificial limb hamper your movement due to technology?

86.6% of patients (52 out of 60) did not indicate that they felt that limited technology hampered their movement. However 13.3% (8 out of 60) patients having been educated to various levels, indicated that they did feel that the limited technology of the prosthesis did hamper their movement. Their individual education levels were as follows. 3 patients out of 8 (37.5%) were educated to A level standard. 1 patient out of 8 (12.5%) were educated to degree level and 3 out of 8 (37.5%) indicated that they had no formal education.

The relationship between these two variables is (Chi – square = 13.413, significance = 0.06) This suggests a 94% confidence of a relationship between the two variables. Although there is a statistical relationship this does not appear to have a bearing on this study due to the comparatively small numbers of responded that the technology of the prosthetic hampered their movement.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.
(ii) Tertiary Variable: Do you need help putting on your artificial limb?

53 out of 60 (88.3) responded that they did not require help to put on their artificial limb, however, 4 in total out of 60 (6.6%) indicated that yes they did require assistance to put on their artificial limbs. The 4 patients education levels were that 25%, 1 patient had a grammar school education, 25%, 1 patient indicated that they had another un-categorized level of education and 2 patients 50% reported having no education at all. This questions significance is (Chi – square = 11.198, significance = 0.6). This question was asked so as to establish the patients level of independence. These results seem to suggest little significance with a 40% confidence of a relationship between the two variables.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(e) Derivation 5: Income level before becoming disabled.

(i) Tertiary Variable: Why do you take off your artificial limb/s?

The following illustrates the patients income before becoming disabled and the reasons for them removing their prosthesis. Patients indicating that they only removed their limbs to got to bed constituted 75% (45 out of 60). Their earnings were as follows 14 patients out of 45 (31.1%) indicated that they earnt under £5000 per annum, 5 out of 45 earnt (11.1%) between £5000 to £9,900, 8 out of 45 earnt (17.7%)
between £10,000 to £14,999, 8 out of 45 earn (17.7%) between £15,000 to £19,999, 6 out of 45 earn (13.3%) between £20,000 to £29,999, 1 out of 45 earn (2.2%) between £30,000 to £39,999 and 3 out of 45 (6.6%) did not respond.

11.6% (7 out of 60) patients indicated that they removed their prosthesis as a result of pain and soreness. Patients reported their earnings like so. 14.2% earn (1 out of 7) under £5000 per annum, 14.2% earn (1 out of 7) between £5,000 to £9,900, 28.5% earn (2 out of 7) between £10,000 to £14,999, 14.2% earn (1 out of 7) between £15,000 to £19,999, 14.2% earn (1 out of 7) between £20,000 to £29,999 and 14.2% earn (1 out of 7) between £30,000 to £39,999,

2 out of 60 patients (3.3%) earning between £5,000 to £9,900 indicated that they only removed their limbs to use the toilet. 1 out of 60 (1.6%) earning between £30,000 to £39,999 indicated that they took their prosthesis off to change their socks and 5 out of 60 (8.3%) did not respond. The reported relationship of these two variables is (Chi-square = 35.962, significance =0.05). This suggests a 95% confidence of a relationship between the two variables.

This relationship may suggest that there is a link between the number of times the patient removes their limb in a day and patients income before becoming an amputee. This variable may suggest that the less the patients removes their prosthetic due to practicality issues such as perspiration or to use the toilet in a day may improve their chance of increasing their earnings beyond the level prior to becoming disabled.
Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(f) Derivation 6: Which limb did you lose?

(i) Tertiary Variable: Does your artificial limb hamper your movement due to your amputation type?

Patients who felt that their amputation type was the cause of their limited movement indicated their amputation level to be the following. 4 patients out of 13 (30.7%) had lost their left leg below knee, 30.7% (3 patients out of 13) had lost their right leg below knee, 1 patient out of 13 (7.6%) had lost their left leg above knee, 30.7% (4 patients out of 13) had lost their right leg above knee. 1 out of 13 (7.6%) had lost both their legs below knee, and 47 out of 60 (78.3%) did not indicate that their amputation type was the cause of their limited movement. The suggested relationship of this variable is (Chi - square = 7.888, significance = 0.09). This suggests a 91% confidence of a relationship between the two variables. Although there is a statistical relationship this does not appear to have a bearing on this study. Additionally as the relationship between these two variables was under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.
(ii) Tertiary Variable: How long are you able to walk in a normal day?

This question was aimed at establishing if there was a limb between the patients amputation level and the duration that they could walk in a normal day.

2 out of 14 (14.2%) of patients having lost their left leg below knee indicated that they could not walk at all. 5 out of 14 (35.7%) indicated that they were able to walk between 5 to 10 minutes per day, 2 out of 14 (14.2%) indicated that they were able to walk between 11 to 30 minutes per day, 2 out of 14 (14.2%) indicated that they were able to walk between 31 minutes to 1 hour per day, 1 out of 14 (7.1%) indicated that they were able to walk between 2 to 4 hours per day and 2 out of 14 (14.2%) indicated that they were able to walk all day.

20% (3 out of 20) of patients having lost their right leg below knee indicated that they could not walk at all. 20% (3 out of 20) indicated that they were able to walk between 5 to 10 minutes per day, 5% (1 out of 20) indicated that they were able to walk between 11 to 30 minutes per day, 5% (1 out of 20) indicated that they were able to walk between 31 minutes to 1 hour per day, 20% (3 out of 20) indicated that they were able to walk between 5 to 8 hours per day 6 out of 20 (30%) indicated that they were able to walk all day and 20% (3 out of 20) did not respond to the question.

1 out of 16 (6.2%) patients having lost their left leg above knee indicated that they could indicated that they were able to walk between 5 to 10 minutes per day, 1 out of 16 (6.5%) indicated that they were able to walk between 11 to 30 minutes per day, 4 out of 16 (25%) indicated that they were able to walk between 31 minutes to 1 hour per day, 2 out of 16 (12.5%) indicated that they were able to walk between 2 to
4 hours per day, 5 out of 16 (31.2%) indicated that they were able to walk between 5 to 8 hours per day, 1 out of 16 (6.2%) indicated that they were able to walk between 9 to 13 hours per day. 1 out of 16 (6.2%) indicated that they were able to walk all day and 1 out of 16 (6.2%) did not respond.

12.5% (1 out of 8) of patients having lost their right leg above knee indicated that they could not walk at all. 12.5% (1 out of 8) indicated that they were able to walk between 31 minutes to 1 hour per day, 37.5% (3 out of 8) indicated that they were able to walk between 2 to 4 hours per day 37.5 (3 out of 8) indicated that they were able to walk all day.

Finally 2 out of 8 (25%) of patient having lost both their legs below knee indicated that they could walk all day.

(Chi – square = 44.425, significance = 0.07) suggests that the amputation level of a patient and the time that they are able to walk in a normal day may be related. Although this variable has a statistical 93% confidence of a relationship between the two variables, the relationship this does not appear to have a bearing on this study.

Furthermore due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.
(iii) Tertiary Variable: Why is your walking distance limited?

This question identifies some of the issues affecting the patients' ability to walk distances.

Patients having lost their left leg below knee reported the following reasons for their limited walk duration, 5 out of 14 (35.7%) indicated other disabilities, 2 out of 14 (14.2%) indicated their age, 1 out of 14 (7.1%) indicated the prosthetics fit, 1 out of 14 (7.1%) indicated they had stump problems, 1 out of 14 (7.1%) indicated the prosthetics foot gave them problems and 1 out of 14 (7.1%) indicated that they were overweight.

Patients having lost their right leg below knee reported the following reasons for their limited walk duration, 15% (3 out of 20) indicated their age, 25% (5 out of 20) indicated fatigue, 5% (5 out of 20) indicated the prosthetics fit, 5% (5 out of 20) indicated that they were still learning and 5% (5 out of 20) indicated that their walking distance was limited to avoid pain.

Patients having lost their left leg above knee reported the following reasons for their limited walk duration, 2 out of 16 (12.5%) indicated fatigue, 6 out of 16 (37.5%) indicated the prosthetics fit, 1 out of 16 (6.2%) indicated their confidence and 2 out of 16 (12.5%) indicated that they were still learning.

Patients having lost their right leg above knee reported the following reasons for their limited walk duration. 12.5% (1 out of 8) indicated their age, 37.5% (3 out of 8)
indicated fatigue, 12.5% (1 out of 8) indicated prosthetics fit 12.5% (1 out of 8) indicated their amputation type and 12.5% (1 out of 8) indicated the weight of the prosthesis.

The significance of this variable is as follows (Chi – square = 68.298, significance = 0.06) this variable has a statistical 94% confidence of a relationship between the two variables.

This may suggest that the higher the level of amputation the more likely the patient is to have difficulties in walking any distance. This may be as a result of several reported issues including energy expenditure while walking, concomitant problems, soreness and discomfort and even the weight of the prosthetic.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(g) Derivation 7 : Income level since becoming disabled.

(i) Tertiary Variable : Do you wear stump socks?

Results are as follows. Patients wearing 1 stump socks earnings were as follows. 1 patient out of 9 (11.1%) earnt under £5,000 per annum, 2 patients out of 9 (22.2%) earnt between £5,000 to £9,900 per annum, 1 patient out of 9 (11.1%) earnt between £10,000 to £14,999 per annum, 1 patient out of 9 (11.1%) earnt between £15,000 to
£19,999 per annum, 2 patients out of 9 (22.2%) earnt between £20,000 to £29,999 per annum, 1 patient out of 9 (11.1%) earnt between £30,000 to £39,999 per annum, and 1 patient out of 9 (11.1%) did not respond as to their earnings.

Patients wearing 2 stump socks earnings were as follows, 20% (5 patients out of 25) earnt under £5,000 per annum, 20% (5 patients out of 25) earnt between £5,000 to £9,900 per annum, 20% (5 patients out of 25) earnt between £10,000 to £14,999 per annum, 20% (5 patients out of 25) earnt between £15,000 to £19,999 per annum, 4% (1 patient out of 25) earnt between £20,000 to £29,999 per annum, 4% (1 patient out of 25) earnt between £30,000 to £39,999 per annum, 8% (2 patients out of 25) earnt between £40,000 to £49,999 per annum, and 4% (1 patient out of 25) did not respond as to their earnings.

Patients wearing 3 stump socks earnings were as follows, 3 patients out of 10 (30%) earnt between £5,000 to £9,900 per annum, 2 patients out of 10 (20%) earnt between £10,000 to £14,999 per annum, 1 patient out of 10 (10%) earnt between £15,000 to £19,999 per annum and 4 patients out of 10 (40%) earnt between £20,000 to £29,999 per annum.

Patients wearing 4 stump socks earnings were as follows, 25% (1 patient out of 4) earnt between £5,000 to £9,900 per annum, 25% (1 patient out of 4) earnt between £10,000 to £14,999 per annum, 25% (1 patient out of 4) earnt between £20,000 to £29,999 per annum and 25% (1 patient out of 4) did not respond as to their earnings.
Patients wearing 12 stump socks earnings were as follows, 1 patient out of 4 (25%) earnt under £5,000 per annum, 2 patients out of 4 (25%) earnt between £20,000 to £29,999 per annum, 1 patient out of 4 (25%) earnt over £60,000 per annum.

Finally 8 out of 60 (13.3%) did not respond. The significance value of this question is (Chi – square = 42.424, significance = 0.3) suggesting that there is little relevance to this correlation. Although this variable has a statistical 70% confidence of a relationship it does not appear to have a bearing on this study. Furthermore as the relationship between the two variables is under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(ii) Tertiary Variable: How long are you able to walk in a normal day?

Patients responded in the following ways. Patients earning under £5,000 per annum responded in the following ways. 2 out of 10 patients (20%) reported walking for between 5 to 10 minutes per day. 2 out of 10 patients (20%) reported walking for between 2 to 4 hours per day. 3 out of 10 patients (30%) reported being able to walk all day and 3 out of 10 patients (30%) did not respond.

Patients earning between £5,000 to £9,900 per annum responded in the following ways. 15.3% of patients (2 out of 13) reported that they could not walk at all 23% of patients (3 out of 13) reported walking for between 5 to 10 minutes per day. 23% of patients (3 out of 13) reported walking for between 11 to 30 minutes per day. 7.6% of patients (1 out of 13) reported walking for between 2 to 4 hours per day. 7.6% of
patients (1 out of 13) reported walking for between 5 to 8 hours per day. 15.3% of patients (2 out of 13) reported being able to walk all day and 7.6% of patients (1 out of 13) did not respond.

Patients earning between £10,000 to £14,999 per annum responded in the following ways. 3 out of 10 patients (30%) reported not being able to walk at all. 4 out of 10 patients (40%) reported walking for between 31 minutes to 1 hour. 2 out of 10 patients (20%) reported walking for between 5 to 8 hours per day and 1 out of 10 patients (10%) reported being able to walk all day.

Patients earning between £15,000 to £19,999 per annum. 14.2% of patients (1 out of 7) reported walking for between 5 to 10 minutes per day. 14.2% of patients (1 out of 7) reported walking for between 11 to 30 minutes per day. 14.2% of patients (1 out of 7) reported walking for between 31 minutes to 1 hour. 14.2% of patients (1 out of 7) reported walking for between 5 to 8 hours per day and 42.8% of patients (3 out of 7) reported being able to walk all day.

Patients earning between £20,000 to £29,999 per annum. 8.3% of patients (1 out of 12) reported that they could not walk at all. 8.3% of patients (1 out of 12) reported walking for between 5 to 10 minutes per day. 16.6% of patients (2 out of 12) reported walking for between 31 minutes to 1 hour 25% of patients (3 out of 12) reported walking for between 2 to 4 hours per day. 16.6% of patients (2 out of 12) reported walking for between 5 to 8 hours per day and 25% of patients (3 out of 12) reported being able to walk all day.
Patients earning between £30,000 to £39,999 per annum. 50% of patients (1 out of 2) reported walking for between 5 to 10 minutes per day and 50% of patients (1 out of 2) reported walking for between 5 to 8 hours per day. Patients earning between £40,000 to £49,999 per annum. 1 out of 2 patients (50%) reported walking for between 31 minutes to 1 hour and 1 out of 2 patients (50%) reported being able to walk all day.

Patients earning over £60,000 per annum, 1.6% of patients (1 out of 60) reported being able to walk all day and 3 out of 60 (5%) of the total patients questioned did not respond.

The suggested association between these two variables is (Chi – square = 80.184, significance = 0.08). This variable seems to suggest that there may be a 92% confidence of a relationship between the patients income since becoming disabled and the time that they are able to walk in a normal day. This may be as a result of the patients fitness levels since amputation having an effect on their ability to adjust to their disability and compensate for the practicality of their prosthetic. This may also be indicative that the patients income is affected by their disability through its potentially limiting factors such as manoeuvrability and increased fatigue.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.
Derivation 8: Occupation before becoming disabled.

Tertiary Variable: How long does it take you to put on your artificial limb/s?

Results are as follows. Patients who were self employed indicated that it took them the following periods of time to put on their artificial limbs. 1 out of 4 (25%) took 1 minute, 2 out of 4 (50%) took 3 minutes and 1 out of 4 (25%) took 10 minutes.

Patients who were manual workers indicated that it took them the following periods of time to put on their artificial limbs. 25% (2 out of 8) took 1 minute, 37.5% (3 out of 8) took 3 minutes, 25% (2 out of 8) took 5 minutes and 25% (2 out of 8) did not respond.

Patients who were professionals indicated that it took them the following periods of time to put on their artificial limbs. 1 out of 2 (50%) took 5 minutes and 1 out of 2 (50%) took 15 minutes.

Patients who were students indicated that it took them the following periods of time to put on their artificial limbs. 50% (6 out of 12) took 1 minute, 33.3% (4 out of 12) took 3 minutes, 12.5% (1 out of 12) took 5 minutes and 12.5% (1 out of 12) took 15 minutes.

Patients who were retired indicated that it took them the following periods of time to put on their artificial limbs. 4 out of 14 (28.5%) took 3 minutes and 2 out of 14 (14.2%) took 5 minutes. 4 out of 14 (28.5%) took 15 minutes and 4 out of 14 (28.5%) did not respond.
Patients who were managers indicated that it took them the following periods of time to put on their artificial limbs. 66.6% (2 out of 3) took 3 minutes and 33.3% (1 out of 3) took 5 minutes.

Patients who were skilled workers/trade indicated that it took them the following periods of time to put on their artificial limbs. 1 out of 4 (25%) took 3 minutes, 2 out of 4 (50%) took 5 minutes and 1 out of 4 (25%) did not know.

Patients who were managers indicated that it took them the following periods of time to put on their artificial limbs. 75% (3 out of 4) took 5 minutes and 25% (1 out of 4) did not respond.

Patients who were public sector workers indicated that it took them the following periods of time to put on their artificial limbs. 1 out of 6 (16.6%) took 1 minute, 2 out of 6 (33.3%) took 3 minutes, 2 out of 6 (33.3%) took 5 minutes and 1 out of 6 (16.6%) took 20 minutes.

Patients who worked in the armed forces indicated that it took them the following periods of time to put on their artificial limbs. 50% (1 out of 2) took 1 minute and 50% (1 out of 2) took 5 minutes.

The relationship between the variables (Chi - square = 83.473, significance = 0.04). Although this variable has a statistical 96% confidence of a relationship between the two variables, the relationship this does not appear to have a bearing on this study.
Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(ii) Tertiary Variable: Why does it in your opinion take you longer than 5 minutes?

1 patient out of 60 (1.6%) who was a student indicated that socks took too long to put on. 3 who were retired (5%) and 1 that was a public sector worker (1.6%) indicated that stump socks took time to put on properly. 1 patient out of 60 (1.6%) who was a skilled worker/trade indicated that hot whether made it more difficult to put on their prosthesis. 1 patient that was self employed (1.6%) and 1 that was a professional (1.6%) indicated that the reason it took them longer than 5 minutes to put on their prosthesis was as they were new amputees.

The relationship between these two variables being the occupation of the patient prior to their amputation and their reason for taking longer than 5 minutes to put on their prosthesis is (Chi – square = 60.903, significance = 0.05). Although this variable has a statistical 95% confidence of a relationship it does not appear to have a bearing on this study.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required
for this study and was not subjected to the non-parametric tests or further examination.

(i) Derivation 9: Occupation since becoming disabled.

(i) Tertiary Variable: Why do you take of your artificial limb/s?

The following illustrates the occupations of patients and the reasons for them removing their prosthesis.

1 out of 45 (2.2%) a director, 3 out of 45 (6.6%) who were self employed, 2 out of 45 (4.4%) who were manual workers, 2 out of 45 (4.4%) who were shop workers, 5 out of 45 (11.1%) who were professionals, 3 out of 45 (6.6%) who were students, 17 out of 45 (47.7%) who were retired, 4 out of 45 (8.8%) who were skilled workers/trade, 5 out of 45 (11.6%) who were office workers, 1 out of 45 (2.2%) who were public sector workers and 2 out of 45 (4.4%) who were home makers all indicated that they removed their prosthesis to go to bed.

14.2% (1 out of 7) a manual worker, 14.2% (1 out of 7) a professional, 14.2% (1 out of 7) a student, 42.8% (3 out of 45) who were retired and 14.2% (1 out of 7) a skilled worker/trade, indicated that they only removed their prosthesis as a result of stump soreness and pain.

1 out of 2 (50%) retired patients and 1 out of 2 (50%) of public sector patients indicated that they removed their limbs to go to the toilet. 1 out of 60 (1.6%) patients
a manager removed their prostheses to change their socks and 5 out of 60 (8.3%) did not respond to the question.

These variables relating to the patients occupation since their limb loss and the reasons for them removing their prostheses during a normal working day seem to suggest a relationship (Chi – square = 115.400, significance = 0.00).

This suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = .013 ) and (Spearman’s roe = .16 ) which will be discussed in chapter 8.

7.7 Conducted Main Variable 4 : Communication

(a) Derivation 1 : Patient, limb fitter communications in conjunction

(i) Tertiary Variable : Which limb fitting centre do you attend?

The results to this question are as follows. Within the Leicester NHS Trust 21 out of 36 (58.3%), and 15 out of 36 (41.6%) in the Luton & Dunstable NHS Trust reported YES they did ask their limb fitter questions.

Alternatively, Within the Leicester NHS Trust 40% (8 out of 20), and 60% (12 out of 20) in the Luton & Dunstable NHS Trust reported NO they did ask their limb fitter questions, and 4 out of the total 60 patients questioned (6.6%) did not respond.
These results seemed to suggest that patients are only to willing and able to ask questions of their limb fitter and the process. The association between the two variables being whether the patient asks their limb fitter questions and the location of their limb fitting centre is (Chi - square = 1.735, significance = 0.4). This suggests that there is little relationship between the two variables with only a 60% confidence of a correlation.

Although there is apparently little confidence of a relationship between the two variables, this data seems to suggests that patients who attend the Leicester NHS Trust are more likely to ask questions of their limb fitter, this may be attributed to any number of possible reasons including, that the patient may have more confidence in the limb fitter and that their personality is more communicative.

Due to the relationship between these two variables being under the required 0.00 or 100%, this variable was not considered to have sufficient statistical relevance required for this study and was not subjected to the non-parametric tests or further examination.

(ii) Tertiary Variable: Are you part of a disabled organisation?

The results to this question are as follows. 7 out of 36 patients (19.4%) who responded yes they did question their limb fitter indicated that they were part of a disability organisation where as 29 out of 36 (80.5%) indicated that they were not. 10% of patients (2 out of 20) who responded no they did not question their limb fitter indicated that they were part of a disability organisation where as 80% (16 out of 20)
indicated that they were not and 2 out of 20 did not respond to the question. 4 out of a total of 60 (6.6%) did not respond to the question at all.

These results seemed to suggest that there is a relationship between the patient being a part of a disabled organisation and whether they question the limb fitter (Chi – square = 27.300, significance = 0.00), or 100% confidence of no relationship. This was confirmed by subjection to the non parametric tests, (Kendall tau-b = 0.36, Spearman’s roe = 0.38) which will be discussed in chapter 8.

(iii) Tertiary Variable: In terms of your own disability how good do you feel your knowledge to be?

Patients who reported yes they did ask their limb fitter questions reported their knowledge of their disability in the following ways. 5 out of 36 (13.8%) indicated poor, 13 out of 36 (36.1%) indicated good, 13 out of 36 (36.1%) indicated very good and 5 out of 36 (13.8%) indicated excellent.

Patients who reported no they did not ask their limb fitter questions reported their knowledge of their disability in the following ways. 15% (3 out of 20) indicated poor, 45% (9 out of 20) indicated good, 25% (5 out of 20) indicated very good, 10% (2 out of 20) indicated excellent and 5% (1 out of 20) did not respond. In total 6.6% (4 out of 60) did not respond at all to the question.

These two variables suggest the following relationship (Chi – square = 48.513, significance = 0.00), this suggests a 100% confidence of a relationship between the
two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.15, Spearman's rho = 0.18) which will be discussed in chapter 8.

(iv) Tertiary Variable: Have you ever received any of the following forms of rehabilitation/counselling at the limb fitting centre? Walking training.

Out of the 60% total number of patients questioned (36 out of 60) who responded yes they asked their limb fitter questions, 36.1% (13 out of 36) had not received walking training and 63.8% (23 out of 36) had received walking training.

Out of the 33.3% of the total number of patients questioned (20 out of 60) who responded no they did not ask their limb fitter questions, 15 out of 20 (75%) had not received walking training and 1 out of 20 (25%) had received walking training.

These two variables suggest the following relationship (Chi-square = 68.333, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.57, Spearman's rho = 0.40) which will be discussed in chapter 8.

(v) Tertiary Variable: Have you ever received any of the following forms of rehabilitation/counselling at the limb fitting centre? Life Coaching.

36 out of the total 60 patients questioned (60%) who responded yes they asked questions of their limb fitter 34 out of 36 (94.4%) had not received life coaching and 2 out of 36 (5.5%) had received life coaching.
20 out of the total 60 patients questioned (33.3%) who responded no they did not ask questions of their limb fitter 19 out of 20 (95%) had not received life coaching and 1 out of 20 (5%) had received life coaching.

These two variables suggest the following relationship (Chi – square = 60.008, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.36, Spearman’s r0e = 0.38) which will be discussed in chapter 8.

(vi) Tertiary Variable: Have you ever received any of the following forms of rehabilitation/counselling at the limb fitting centre? Disablement Counselling.

56 out of the total 60 patients questioned indicated no they had never received any disablement counselling, from this 36 out of 60 (60%) indicated yes that they did question their limb fitter and 20 out of 60 (33.3%) indicated that they did not. Null responses accounted for 6.6% (4 out of 60).

These two variables suggest the following relationship (Chi – square = 60.000, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.48, Spearman’s r0e = 0.50) which will be discussed in chapter 8.
(vii) Tertiary Variable: Have you ever received any of the following forms of rehabilitation/counselling at the limb fitting centre? General Disability Information.

36 out of the total 60 patients questioned (60%) who responded yes they asked questions of their limb fitter 35 out of 36 (97.2%) had not received general disability information while 1 out of 36 (2.7%) had received general disability information.

20 out of the total 60 patients questioned (33.3%) who responded no they did not ask their limb fitter questions had also not received any form of general disability information.

These two variables suggest the following relationship (Chi – square = 60.606, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.39, Spearman’s rho = 0.41) which will be discussed in chapter 8.

(viii) Tertiary Variable: Have you ever received any of the following forms of rehabilitation/counselling at the limb fitting centre? Other forms of Rehabilitation counselling.

Out of 60% of patients (36 out of 60) who responded yes they asked their limb fitter questions, 21 out of 36 (58.3%) had received other forms of rehabilitation counselling while 15 out of 36 (41.6%) had not. Out of 33.3% of patients (20 out of 60) who responded no they did not ask their limb fitter questions, 35% (7 out of 20) had
received other forms of rehabilitation counselling while 65% (13 out of 20) had not. In total 6.6% (4 out of 60) did not respond at all to the question.

These two variables suggest the following relationship (Chi-square = 63.000, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.40, Spearman’s r = 0.41) which will be discussed in chapter 8.

(ix) Tertiary Variable: Have you ever received counselling about your disability?

Patients responding yes that they did question their limb fitter, responded like so. 3 out of 36 (8.3%) had received counselling and 33 out of 36 (91.6%) had not received counselling. Patients responding no they did not question their limb fitter, responded like so. 2 out of 20 (10%) had received counselling, 17 out of 20 (85%) had not received counselling and 1 out of 20 (5%) did not respond.

These two variables suggest the following relationship (Chi-square = 47.640, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.34, Spearman’s r = 0.36) which will be discussed in chapter 8.
Tertiary Variable: How well do you feel you are included in the decisions concerning your prosthetic?

Patients responding yes that they did question their limb fitter, indicated their satisfaction in the following ways. 2.7% (1 out of 36) indicated that they did not feel they were included at all, 2.7% (1 out of 36) responded poorly, 41.6% (15 out of 36) satisfactorily, 38.8% (14 out of 36) very well and 13.8% (5 out of 36) indicated that they were excellently included.

Patients responding no that they did not question their limb fitter, indicated their satisfaction in the following ways. 10% (2 out of 20) responded poorly, 45% (9 out of 20) satisfactorily, 25% (4 out of 20) very well, 25% (4 out of 20) indicated that they were excellently included and 5% (1 out of 20) did not respond. Additionally in total 4 out of 60 (6.6%) did not respond at all.

These two variables suggest the following relationship (Chi – square = 51.350, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.18, Spearman’s rho = 0.21) which will be discussed in chapter 8.

Tertiary Variable: How well do you feel you are informed about decisions concerning your prosthetic?

Patients responding yes that they did question their limb fitter, indicated their satisfaction in the following ways. 2 out of 36 (5.5%) indicated that they did not feel
they were informed at all, 1 out of 36 (2.7%) responded poorly, 13 out of 36 (36.1%) were satisfied, 14 out of 36 (38.8%) responded very well and 6 out of 36 (16.6%) indicated that they were excellently well included.

Patients responding no that they did not question their limb fitter, indicated their satisfaction in the following ways. 2 out of 20 (10%) responded poorly, 9 out of 20 (45%) were satisfied, 4 out of 20 (25%) very well, 4 out of 20 (25%) indicated that they were excellently included and 1 out of 20 (5%) did not respond. Additionally in total 4 out of 60 (6.6%) did not respond at all.

These two variables suggest the following relationship (Chi – square = 51.952, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.18, Spearman’s rho = 0.20) which will be discussed in chapter 8.

(xii) Tertiary Variable : How able do you feel you are at describing the problems with your prosthetic to the limb fitter?

Patients responding yes that they did question their limb fitter, indicated their satisfaction in the following ways. 2.7% (1 out of 36) indicated that the did not feel they were able to describe problems included at all, 13.8% (1 out of 36) responded poorly, 25% (9 out of 36) reported satisfactorily, 44.4% (16 out of 36) indicated very well and 13.8% (5 out of 36) indicated that they were excellent.
Patients responding no that they did not question their limb fitter, indicated their satisfaction in the following ways. 10% (2 out of 20) responded poorly, 55% (11 out of 20) indicated satisfactorily, 10% (2 out of 20) responded very well, 25% (4 out of 20) indicated that they were excellently included and 5% (1 out of 20) did not respond. In total 4 out of 60 (6.6%) did not respond at all.

These two variables suggest the following relationship (Chi – square = 57.167, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.15, Spearman’s roe = 0.18) which will be discussed in chapter 8.

(xiii) Tertiary Variable: How well do you feel your descriptions are understood and alterations made?

Patients responding yes that they did question their limb fitter, indicated their satisfaction in the following ways. 3 out of 36 (8.3%) indicated that they were not understood at all, 2 out of 36 (5.5%) responded poorly, 12 out of 36 (33.3%) were satisfied, 14 out of 36 (38.8%) responded very well and 6 out of 36 (16.6%) indicated that they were excellently understood.

Patients responding no that they did not question their limb fitter, indicated their satisfaction in the following ways. 3 out of 20 (15%) responded poorly, 8 out of 20 (40%) were satisfied, 4 out of 20 (25%) very well, 4 out of 20 (25%) indicated that they were excellently understood and 1 out of 20 (5%) did not respond. 4 out of 60 (6.6%) did not respond at all.
These two variables suggest the following relationship (Chi – square = 52.711, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.20, Spearman’s rho = 0.23) which will be discussed in chapter 8.

(xiii) Tertiary Variable: Have you ever been offered information on (Your Disability)

Patients responding yes that they did question their limb fitter, indicated the following
10 out of 36 (27.7%) indicated yes they had been offered information on their disability 25 out of 36 (69.4%) indicated no they had never been offered information on their disability, and 1 out of 36 (2.7%) did not respond.

Patients responding no that they did not question their limb fitter, indicated their satisfaction in the following ways. 5 out of 20 (25%) responded yes they had received information on their disability, 14 out of 20 (70%) had not and 1 out of 20 (5%) did not respond at all.

These two variables suggest the following relationship (Chi – square = 38.675, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.26, Spearman’s rho = 0.28) which will be discussed in chapter 8.
Tertiary Variable: Have you ever been offered information on (Your prostheses)

Patients responding yes that they did question their limb fitter, indicated the following in response to this variable. 52.7% (19 out of 36) indicated yes they had been offered information on their prostheses, 47.2% (17 out of 36) indicated no they had never been offered information on their prostheses. Patients responding no that they did not question their limb fitter, indicated the following in response to this variable. 30% (6 out of 20) responded yes they had received information on their prostheses, 65% (13 out of 20) had not and 1 out of 20 (5%) did not respond at all.

These two variables suggest the following relationship (Chi – square = 49.942, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.40, Spearman’s roe = 0.42) which will be discussed in chapter 8.

Tertiary Variable: Have you ever been offered information on (The limb fitting process)

Patients responding yes that they did question their limb fitter, indicated the following 16 out of 36 (44.4%) indicated yes they had been offered information on the limb fitting process, 20 out of 36 (55.5%) indicated no they had never been offered information on the limb fitting process.
Patients responding no that they did not question their limb fitter, indicated their satisfaction in the following ways. 6 out of 20 (30%) responded yes they had received information on the limb fitting process, 13 out of 20 (65%) had not and 1 out of 20 (5%) did not respond at all.

These two variables suggest the following relationship (Chi – square = 48.469, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.35, Spearman’s r = 0.36) which will be discussed in chapter 8.

(xvii) Tertiary Variable: Have you ever been offered information on (Amputee Health Care)

Patients responding yes that they did question their limb fitter, indicated the following in response to this variable. 30.5% (11 out of 36) indicated yes they had been offered information on amputee health care, 66.6% (24 out of 36) indicated no they had never been offered such information and 2.7% (1 out of 20) did not respond.

Patients responding no that they did not question their limb fitter, indicated the following in response to this variable. 25% (5 out of 20) responded yes they had received information on amputee health care, 70% (14 out of 20) had not and 1 out of 20 (5%) did not respond at all.

These two variables suggest the following relationship (Chi – square = 38.806, significance = 0.00), this suggests a 100% confidence of a relationship between the
two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.28, Spearman's roe = 0.29) which will be discussed in chapter 8.

(xviii) Tertiary Variable: If you have received information on (Your Disability) how useful was it?

Patients responding yes that they did question their limb fitter, indicated their satisfaction with the information they had received on their disability in the following ways. 3 out of 36 (8.3%) responded that it was good, 5 out of 36 (13.8%) responded that it was very good, 3 out of 36 (8.3%) responded that it was excellent, 24 out of 36 (66.6%) reiterated that they had never received any such information and 1 out of 36 (2.7%) did not respond at all.

Patients responding no that they did not question their limb fitter, indicated their satisfaction in the following ways. 1 out of 20 (5%) responded that it was poor, 2 out of 20 (10%) responded that it was good, 1 out of 20 (5%) responded that it was excellent, 15 out of 20 (75%) reiterated that they had never received any such information and 1 out of 20 (5%) did not respond at all. In total there were 4 out of 60 (6.6%) null responses.

These two variables suggest the following relationship (Chi-square = 43.934, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.29, Spearman's roe = 0.31) which will be discussed in chapter 8.
Tertiary Variable: If you have received information on (Your prosthetic) how useful was it?

Patients responding yes that they did question their limb fitter, indicated their satisfaction with the information they had received on their prosthetic in the following ways. 2.7% (1 out of 36) responded that it was poor, 27.7% (10 out of 36) responded that it was good, 5.5% (2 out of 36) responded that it was very good, 2.7% (1 out of 36) responded that it was excellent and 27.7% (10 out of 36) reiterated that they had never received any such information. Patients responding no that they did not question their limb fitter, indicated their satisfaction in the following ways. 5% (1 out of 20) responded that it was poor, 25% (5 out of 20) responded that it was good, 10% (2 out of 20) responded that it was very good, 5% (1 out of 20) responded that it was excellent, 10% (2 out of 20) reiterated that they had never received any such information and 5% (1 out of 20) did not respond at all.

These two variables suggest the following relationship (Chi-square = 48.978, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.26, Spearman's rho = 0.29) which will be discussed in chapter 8.
Tertiary Variable: If you have received information on (The limb Fitting Process) how useful was it?

Patients responding yes that they did question their limb fitter, indicated their satisfaction with the information they had received on the limb fitting process in the following ways. 1 out of 36 (2.7%) responded that it was poor, 6 out of 36 (16.6%) responded that it was good, 4 out of 36 (11.1%) responded that it was very good, 4 out of 36 (11.1%) responded that it was excellent and 21 out of 36 (58.3%) reiterated that they had never received any such information.

Patients responding no that they did not question their limb fitter, responded in the following ways. 1 out of 20 (5%) responded that it was poor, 1 out of 20 (5%) responded that it was good, 1 out of 20 (5%) responded that it was very good, 3 out of 20 (15%) responded that it was excellent, 13 out of 20 (65%) reiterated that they had never received any such information and 1 out of 20 (5%) did not respond at all.

4 out of 60 (6.6%) in total did not respond. These correlation's suggests a relationship between the two variables.

These two variables suggest the following relationship (Chi – square = 50.063, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.32, Spearman’s rho = 0.35) which will be discussed in chapter 8.
Tertiary Variable: If you have received information on (Amputee Health Care) how useful was it?

Patients responding yes that they did question their limb fitter, indicated their satisfaction with the information they had received on amputee health care in the following ways. 11.1% (4 out of 36) responded that it was good, 11.1% (4 out of 36) responded that it was very good, 5.5% (2 out of 36) responded that it was excellent, 69.4% (25 out of 36) reiterated that they had never received any such information and 2.7% (1 out of 36) did not respond.

Patients responding no that they did not question their limb fitter, indicated their satisfaction in the following ways. 5% (1 out of 20) responded that it was poor, 10% (2 out of 20) responded that it was good, 5% (1 out of 20) responded that it was excellent, 75% (15 out of 20) reiterated that they had never received any such information and 5% (1 out of 20) did not respond at all.

These two variables suggest the following relationship (Chi-square = 43.028, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.28, Spearman's rho = 0.30) which will be discussed in chapter 8.
(xxii) Tertiary Variable: If you have never received any such information would you consider it useful?

Patients responding yes that they did question their limb fitter, indicated their response in the following ways when asked if they felt receiving information on their disability, prostheses, limb fitting process and amputee health care would be useful to them.

33 out of 36 (91.6%) responded that they would feel such information useful and 3 out of 36 (8.3%) indicated no that they would not consider it useful.

Patients responding no that they did question their limb fitter, indicated their response in the following ways to their receiving information on their disability, prostheses, limb fitting process and amputee health care would be useful to them.

20 out of 20 (100%) responded that they would consider information useful.

Therefore 53 out of 60 (88.3%) indicated that they would consider and information on their disability, prostheses, limb fitting process and amputee health care useful.

These two variables suggest the following relationship (Chi – square = 61.887, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.27, Spearman’s roe = 0.29) which will be discussed in chapter 8.
(xxiii) Tertiary Variable: Have you ever been offered information concerning the choice of prostheses available to you?

Patients responding yes that they did question their limb fitter, responded in the following ways with regards being offered information concerning available prosthetic choice. 50% (18 out of 36) responded yes they had received information on the choice of available prostheses and 50% (18 out of 36) responded no they had never received information on the choice of available prostheses.

Patients responding no that they did not question their limb fitter, responded in the following ways with regards being offered information concerning available prosthetic choice. 25% (5 out of 20) responded yes they had received information on the choice of available prostheses, 70% (14 out of 20) responded no they had never received information on the choice of available prostheses and 5% (1 out of 20) did not respond. In total 6.6% (4 out of 60) did not respond at all.

These two variables suggest the following relationship (Chi – square = 50.589, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.42, Spearman’s rho = 0.44) which will be discussed in chapter 8.
Tertiary Variable: Would you like more information concerning the choice of prostheses available to you?

Patients responding yes that they did question their limb fitter, responded in the following ways with regards being offered more information concerning available prosthetic choice. 29 out of 36 (80.5%) responded yes they would like to receive more information on the choice of available prostheses and 7 out of 36 (19.4%) responded that they would not like to receive more information on the choice of available prostheses.

Patients responding no that they did question their limb fitter, responded in the following ways with regards being offered more information concerning available prosthetic choice. 12 out of 20 (60%) responded yes they would like to receive more information on the choice of available prostheses, 5 out of 20 (25%) responded that they would not like to receive more information on the choice of available prostheses and 3 out of 20 (15%) did not respond at all.

These two variables suggest the following relationship (Chi – square = 35.922, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.42, Spearman's rho = 0.44) which will be discussed in chapter 8.
Tertiary Variable: How often do you need new artificial limbs?

Patients responding yes that they did question their limb fitter, indicated that they required new or replacement prostheses with the following frequencies. 25% (9 out of 36) responded once a year, 27.7% (10 out of 36) every two years, 36.1% (13 out of 36) every five years, 2.7% (1 out of 36) responded other and 8.3% (3 out of 36) did not respond.

Patients responding no they did not question their limb fitter, indicated that they required new or replacement prostheses with the following frequencies. 15% (3 out of 20) responded once a year, 35% (7 out of 20) every two years, 20% (4 out of 20) every five years, 20% (4 out of 20) responded other and 10% (2 out of 20) did not respond.

These two variables suggest the following relationship (Chi – square = 30.943, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.27, Spearman’s roe = 0.30) which will be discussed in chapter 8.

Tertiary Variable: How long does it take you to be fitted with a new prostheses (weeks)?

Patients responding yes that they did question their limb fitter, indicated that they were fitted with new or replacement prostheses within the following duration’s. 11.1% (4 out of 36) responded within 2 weeks, 33.3% (12 out of 36) within 3 weeks,
11.1% (4 out of 36) within 4 weeks, 8.3% (3 out of 36) within 5 weeks, 13.8% (5 out of 36) within 6 weeks, 5.5% (2 out of 36) within 8 weeks, 2.7% (1 out of 36) within 10 weeks, 5.5% (2 out of 36) more than 11 weeks and 2.7% (1 out of 36) did not know and 5.5% (2 out of 36) did not respond.

Patients responding no that they did not question their limb fitter, indicated that they were fitted with new or replacement prostheses within the following duration’s. 10% (2 out of 20) responded within 2 weeks, 25% (5 out of 20) within 3 weeks, 5% (1 out of 20) within 4 weeks, 20% (4 out of 20) within 6 weeks, 5% (1 out of 20) within 10 weeks, 15% (3 out of 20) more than 11 weeks, 5% (1 out of 20) did not know and 15% (3 out of 20) did not respond.

This data suggest that if the patient questions the limb fitter the number of weeks that it takes to fit a new prosthetic is increased. This suggests that if the patient communicates problems with the prosthetic during manufacture the longer it will take to produce the limb to the patient satisfaction. (Chi – square = 31.011, significance = 0.02) at 98% confidence of a relationship.

Although there was an association between these two variables it was under the required 0.00 or 100%, this variable was not considered to have the sufficient statistical relevance required for this study and was therefore not subjected to the non-parametric tests or further examination.
(xxvii) Tertiary Variable: How long does it take you to be fitted with a new prostheses (appointments)?

Patients responding yes that they did question their limb fitter, indicated that they were fitted with new or replacement prostheses within the following duration’s. 5 out of 36 (13.8%) responded within 2 appointments, 16 out of 36 (44.4%) within 3 appointments, 7 out of 36 (19.4%) within 4 appointments, 1 out of 36 (2.7%) within 5 appointments, 2 out of 36 (5.5%) within 6 appointments, 1 out of 36 (2.7%) within 7 appointments, 1 out of 36 (2.7%) within 8 appointments and 1 out of 36 (2.7%) more than 11 appointments, 2 out of 36 (5.5%) did not respond.

Patients responding no that they did not question their limb fitter, indicated that they were fitted with new or replacement prostheses within the following duration’s. 4 out of 20 (20%) responded within 2 appointments, 5 out of 20 (25%) within 3 appointments, 3 out of 20 (15%) within 4 appointments, 1 out of 20 (5%) within 6 appointments, 3 out of 20 (15%) more than 11 weeks, 4 out of 20 (20%) did not respond. In total 4 out of 60 (6.6%) did not respond to the question.

This data suggest that if the patient does not question the limb fitter the number of appointments that it takes to fit a new prosthetic is decreased. This may suggest that if the patient does not communicate problems with the prosthetic during manufacture the longer it will take less time to produce the prosthetic but this may impact patient satisfaction and prosthetic fit comfort and practicality. (Chi – square = 29.574, significance = 0.02) at 98% confidence of a relationship.
Although there was an association between these two variables it was under the required 0.00 or 100%, this variable was not considered to have the sufficient statistical relevance required for this study and was therefore not subjected to the non-parametric tests or further examination.

(xxviii) Tertiary Variable: Do you wear stump socks?

Patients responding yes that they did question their limb fitter, indicated that they wore stump socks in the following ways. 83.3% (30 out of 36) responded yes they wore stump socks, 13.8% (5 out of 36) responded no they did not wear stump socks and 2.7% (1 out 36) did not respond.

Patients responding no that they did not question their limb fitter, indicated that they wore stump socks in the following ways. 85% (17 out of 20) responded yes they wore stump socks, 5% (1 out of 20) responded no they did not wear stump socks and 10% (2 out 20) did not respond. In total 6.6% (4 out of 60) did not respond to the question at all.

These two variables suggest the following relationship (Chi – square = 34.044, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.26, Spearman’s roe = 0.28) which will be discussed in chapter 8.
Tertiary Variable: If you do you wear stump socks how many do you wear?

Patients responding yes that they did question their limb fitter, indicated that they wore the following number of stump socks. 6 out of 36 (16.6%) responded that they wore 1 sock, 17 out of 36 (47.2%) 2 socks, 6 out of 36 (16.6%) 3 socks, 2 out of 36 (5.5%) 4 socks, 3 out of 36 (8.3%) 12 socks and 2 out of 36 (5.5%) did not respond.

Patients responding no that they did not question their limb fitter indicated that they wore the following number of stump socks. 3 out of 20 (15%) responded that they wore 1 sock 8 out of 20 (40%) 2 socks, 4 out of 20 (20%) 3 socks, 2 out of 20 (10%) 4 socks, 1 out of 20 (5%) 12 socks and 2 out of 20 (10%) did not respond. In total 4 out of 60 (6.6%) did not respond to the question.

These two variables suggest the following relationship (Chi - square = 29.913, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.26, Spearman’s rho = 0.28) which will be discussed in chapter 8.

Tertiary Variable: How long does it take you to put on your prostheses?

Patients responding yes that they did question their limb fitter, indicated that it took the following times to put on their prostheses. 16.6% (6 out of 36) responded within 1 minute, 33.3% (12 out of 36) within 3 minutes, 33.3% (12 out of 36) within 5
minutes, 13.8% (5 out of 36) within 15 minutes and 5.5% (1 out of 36) did not respond.

Patients responding no that they did not question their limb fitter, indicated that it too the following times to put on their prostheses. 25% (5 out of 20) responded within 1 minute, 30% (6 out of 20) within 3 minutes, 15% (3 out of 20) within 5 minutes, 5% (1 out of 20) within 10 minutes, 5% (1 out of 20) within 15 minutes, 5% (1 out of 20) within 20 minutes, 5% (1 out of 20) did not know and 10% (2 out of 20) did not respond.

These two variables suggest the following relationship (Chi – square = 42.089, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.18, Spearman’s r = 0.21) which will be discussed in chapter 8.

(xxxi) Tertiary Variable : Does the socket affect your stump?

Patients responding yes that they did question their limb fitter, indicated whether the socket affected their stumps in the following ways. 41.6% (15 out of 36) responded yes the socket does affect their stump, 41.6% (15 out of 36) responded no the socket did not affect their stump and 16.6% (6 out of 36) did not respond.

Patients responding no that they did not question their limb fitter, responded in the following ways. 85% (17 out of 20) responded no the socket does not affect their stump and 8.3% (3 out of 20) did not respond. Finally 4 out of 60 (6.6%) did not
respond to the question at all. The suggested relationship between the two variables under test is.

These two variables suggest the following relationship (Chi – square = 28.966, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.42, Spearman’s roe = 0.44) which will be discussed in chapter 8.

(xxxii) Tertiary Variable: Is the fit of your prostheses comfortable?

Patients responding yes that they did question their limb fitter, indicated the following when asked about the comfort levels of their prostheses. 22 out of 36 (61.1%) responded yes they felt their prostheses comfortable, 8 out of 36 (22.2%) no they felt their prostheses was not comfortable, 4 out of 36 (11.1%) responded other and 2 out of 36 (5.5%) did not respond. Patients responding no that they did not question their limb fitter, indicated the following when asked about the comfort levels of their prostheses. 10 out of 20 (50%) responded yes they felt their prostheses comfortable, 4 out of 20 (20%) no they felt their prostheses was not comfortable, 3 out of 20 (15%) responded other and 3 out of 20 (15%) did not respond.

These two variables suggest the following relationship (Chi – square = 25.546, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.30, Spearman’s roe = 0.32) which will be discussed in chapter 8.
Tertiary Variable: Does your prostheses hamper your movement in any way?

Patients responding yes that they did question their limb fitter, indicated whether the prostheses hampered their movement like so. 69.4% (25 out of 36) responded yes their prostheses does hamper their movement, 25% (9 out of 36) responded no their prostheses does not hamper their movement and 5.5% (2 out of 36) did not respond. Patients responding no that they did not question their limb fitter, indicated whether the prostheses hampered their movement like so. 50% (10 out of 20) responded yes their prostheses does hamper their movement, 30% (6 out of 20) responded no their prostheses does not hamper their movement and 20% (4 out of 20) did not respond.

These two variables suggest the following relationship (Chi – square = 24.000, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.30, Spearman’s roe = 0.32) which will be discussed in chapter 8.

Tertiary Variable: Does your artificial limb hamper your movement due to its fit?

Patients responding yes that they did question their limb fitter, indicated whether their movement was hampered due to the fit of the prostheses. 27.7% (10 out of 36) responded yes their prostheses does hamper their movement due to its fit, 55.5% (20 out of 36) responded no their prostheses does not hamper their movement due to its fit and 16.6% (6 out of 36) did not respond.
Patients responding no that they did not question their limb fitter, indicated whether their movement was hampered due to the fit of the prostheses. 30% (6 out of 20) responded yes their prostheses does hamper their movement due to its fit, 50% (10 out of 20) responded no their prostheses does not hamper their movement due to its fit and 20% (4 out of 20) did not respond.

These two variables suggest the following relationship (Chi – square = 14.246, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.18, Spearman’s rho = 0.19) which will be discussed in chapter 8.

Tertiary Variable: Does your artificial limb hamper your movement due to its design?

Patients responding yes that they did question their limb fitter, indicated whether their movement was hampered due to the design of the prostheses. 22.2% (8 out of 36) responded yes their prostheses does hamper their movement due to its design, 61.1% (22 out of 36) responded no their prostheses does not hamper their movement due to its design and 16.6% (6 out of 36) did not respond. Patients responding no that they did not question their limb fitter, indicated whether their movement was hampered due to the design of the prostheses. 25% (5 out of 20) responded yes their prostheses does hamper their movement due to its design, 50% (10 out of 20) responded no their prostheses does not hamper their movement due to its design and 25% (5 out of 20) did not respond. Finally 6.6% (4 out of 60) did not respond to the question at all.
These two variables suggest the following relationship (Chi - square = 13.558, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.20, Spearman’s rö = 0.22) which will be discussed in chapter 8.

(xxxvi) Tertiary Variable: Does your artificial limb hamper your movement due to technology?

Patients responding yes that they did question their limb fitter, indicated whether their movement was hampered due to the technology of the prostheses. 13.8% (5 out of 36) responded yes their prostheses does hamper their movement due to technology, 69.4% (25 out of 36) responded no their prostheses does not hamper their movement due to technology and 16.6% (6 out of 36) did not respond.

Patients responding no that they did not question their limb fitter, indicated whether their movement was hampered due to the technology of the prostheses. 25% (5 out of 20) responded yes their prostheses does hamper their movement due to technology, 50% (10 out of 20) responded no their prostheses does not hamper their movement due to technology and 25% (5 out of 20) did not respond. Finally 6.6% (4 out of 60) did not respond to the question at all.

These two variables suggest the following relationship (Chi - square = 15.000, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.16, Spearman’s rö = 0.18) which will be discussed in chapter 8.
Tertiary Variable: Does your artificial limb hamper your movement due to your own limitations?

Patients responding yes that they did question their limb fitter, indicated whether their movement was hampered due to your own limitations. 36.1% (13 out of 36) responded yes their prostheses does hamper their movement due to your own limitations, 47.2% (17 out of 36) responded no their prostheses does not hamper their movement due to your own limitations and 16.6% (6 out of 36) did not respond.

Patients responding no that they did not question their limb fitter, indicated whether their movement was hampered due to your own limitations 45% (9 out of 20) responded yes their prostheses does hamper their movement due to your own limitations, 40% (8 out of 20) responded no their prostheses does not hamper their movement due to your own limitations and 15% (3 out of 20) did not respond. Finally 6.6% (4 out of 60) did not respond to the question at all.

These two variables suggest the following relationship (Chi – square = 15.949, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.12, Spearman’s roe = 0.13) which will be discussed in chapter 8.
Tertiary Variable: What sort of fit do you prefer within your prostheses?

Patients responding yes that they did question their limb fitter, indicated that they preferred the following forms of fit. 3 out of 36 (8.3%) responded that they preferred movement within their socket, 31 out of 36 (86.1%) preferred a close fit, 1 out of 36 (2.7%) did not know and 1 out of 36 (2.7%) did not respond.

Patients responding no that they did not question their limb fitter indicated that they preferred the following forms of fit. 4 out of 20 (20%) responded that they preferred movement within their socket, 11 out of 20 (55%) preferred a close fit, 3 out of 20 (15%) did not know and 2 out of 20 (10%) did not respond. 6.6% (4 out of 60) did not respond to the question at all.

These two variables suggest the following relationship (Chi-square = 39.183, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.28, Spearman’s r = 0.31) which will be discussed in chapter 8.

Tertiary Variable: Do you feel you walk well in your artificial limb?

Patients responding yes that they did question their limb fitter, indicated whether they felt they walked well in their artificial limb. 75% (27 out of 36) responded yes they felt they walked well in their artificial limb, 22.2% (8 out of 36) responded no they felt they did not walk well in their artificial limb. 2.7% (1 out of 36) did not respond.
Patients responding no that they did not question their limb fitter, indicated whether they felt they walked well in their artificial limb. 55% (11 out of 20) responded yes they felt they walked well in their artificial limb, 35% (7 out of 20) responded no they felt they did not walked well in their artificial limb, 10% (2 out of 20) did not respond. Finally 6.6% (4 out of 60) did not respond to the question at all.

These two variables suggest the following relationship (Chi - square = 34.676, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.38, Spearman’s roe = 0.40) which will be discussed in chapter 8.

(ffff) Tertiary Variable : Why in your opinion is your walking distance limited.

Patients responding yes that they did question their limb fitter, indicated that their walking distance was limited in their opinion due to the following reasons.

Not limited 8 out of 36 (22.2%), other disabilities 4 out of 36 (11.1%), age 3 out of 36 (8.3%), fatigue 6 out of 36 (16.6%), fit of limb 8 out of 36 (22.2%), still learning 1 out of 36 (2.7%), stump problems 1 out of 36 (2.7%), the artificial foot 1 out of 36 (2.7%), my weight I am too fat 1 out of 36 (2.7%), type of amputation 1 out of 36 (2.7%), the weight of the prosthesis 1 out of 36 (2.7%) and 1 out of 36 (2.7%) did not respond.

Patients responding no that they did not question their limb fitter, indicated that their walking distance was limited in their opinion due to the following reasons.
Not limited 7 out of 20 (35%), other disabilities 2 out of 20 (10%), age 3 out of 20 (15%), fatigue 4 out of 20 (20%), fit of limb 1 out of 20 (5%), still learning 1 out of 20 (5%), and 2 out of 20 (10%) did not respond. 6.6% (4 out of 60) did not respond to the question at all.

These two variables suggest the following relationship (Chi-square = 45.396, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.16, Spearman’s r = 0.25) which will be discussed in chapter 8.

(xxxx) Tertiary Variable: Do you ask your limb fitter questions

The results to this question are as follows. Within the Leicester NHS Trust 21 out of 31 (67%), and 15 out of 30 (50%) in the Luton & Dunstable NHS Trust reported yes they did question their limb fitter. Within the Leicester NHS Trust 8 out of 31 (25%), and 12 out of 30 (40%) in the Luton & Dunstable NHS Trust reported no they did not question their limb fitter and 4 in total did not respond.

These two variables suggest the following relationship (Chi-square = 35.574, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.53, Spearman’s r = 0.55) which will be discussed in chapter 8.
7.8 Summary

This chapter has illustrated the array of factors affecting the patients satisfaction with their prosthesis encompassed in the variables of fit, comfort, practicality and the newly recognized variable of patient prosthesis communications.

The next chapter will examine the variables of 0.00 or 100% confidence of a relationship identified by the use of Chi-square at 0.00 significance level (100% confidence) and test the strength of significant associations through the use of Kendall tau-b and Spearman’s roe. Thus proving the relationships statistical significance and pertinence to this study.
CHAPTER 8

SPECIFIC FINDINGS: USER RESPONSE IN RELATION TO THE MAIN
PROPOSITIONS - FIT, COMFORT, PRACTICALITY AND COMMUNICATION

8.1 Introduction

The aim of this chapter is to empirically test the relationship between patient
prosthetic satisfaction and the propositions statistically illustrated in the previous
chapter, specifically relating to the main variables under investigation.

Differences in the fit of the prostheses will produce differences in user attitudes, that
is the more suitable the prostheses to the individual the higher their level of
satisfaction.

Patient satisfaction as specified by the identifier of prosthetic fit has been associated
with many factors including the efficiency of prosthetics users mobility, as
substantiated by Piro (2000) that “a highly functional foot cannot work well for a BK
amputee with an ill fitting prosthetic socket”. He also suggests that in-addition to the
demands for less weight, higher stability and greater durability of the new materials
that there has also been an increase in the demands of the individual for several
improvements including better prosthetic fit. He further reinforces the importance of
prosthetic fit “ above all the different requirements, expectations and handicaps, there
is this one principal: the socket has to fit ” (Piro, 2000).

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Differences in the comfort of the prostheses will produce differences in user attitudes, that is the more suitable the prostheses to the individual the higher their level of satisfaction.

The comfort of the prosthetic is of importance to the amputee based on several publications including Covey et al, (2000) in which they describes the comparison of mechanical properties and friction levels of various prosthetic liner tissues. Covey and colleagues go on to describe sub-variables all of which they found to impact on patient/prosthetic comfort including liner material, energy absorption and impact and the displacement of the residual limb in response to differing liner materials (Covey, 2000).

Differences in the practical use of the prostheses within the lifestyle of the patient will produce differences in user attitudes, that is the more suitable the prostheses to the individuals lifestyle the higher their level of satisfaction.

The practicality of wearing the prosthetic is an issue of importance to the amputee in many respects. Issues that can be encompassed by the term practicality are infinite and can not practically be examined with any depth within the constraints of many studies as practicality issues are wholly dependent upon user/amputee response and perception. However many researchers have attempted to reach a level of understanding which can be grouped within the context of practicality with literature examining issues ranging from prosthetic wear duration, donning and doffing of the limb, ease of strap application if any and perspiration level (Peethambaran, 2000). Further studies have identified differing issues within practicality such as Legro et al,
(1999) who identified the avoidance of blisters and sores, undesirable smelling prosthetic, weight of the prosthetic and avoidance of the prosthetic damaging clothing.

Differences in the level of communication held between the patient and prosthetist at all levels and stages of the limb fitting process will produce differences in user attitudes, that is the more communication between both parties the more suitable the prostheses to the individual the higher their level of satisfaction.

Supplementary to the previous measurable variables the psyche of the patient was explored in relation to their satisfaction with their prosthetic. However, it has been argued that the psychological build of the patient was impacted by a multitude of factors including those under investigation, (Legro et al, 1999). Notwithstanding the difficulties it was decided that this factor would be monitored, with a view that in the event of clear irrefutable evidence it would be referred to and elaborated on in greater detail, should it be desired?

Differences in the combined issues of prostheses, fit, comfort and practicality will produce differences in user attitudes, that is the more suitable the prostheses to the individual the higher their level of satisfaction.

Psychological issues identified within the bounds of patient satisfaction, as reported by amputees are predominantly linked to the patient developing a positive body image, with failure to do so resulting in the possible manifestation of depression, anxiety and reduced self esteem (Henker, 1979) and (Kashani, 1983). Such
psychological imbalances including depression are evoked due to physical, social and emotional adjustments, with many older amputees never becoming able to walk with a prosthesis (Williamson, 1995).

The identification of factors that lead to the construction of psychological barriers for the amputee can drastically reduce the susceptibility of those predisposed to adapt poorly. Such factors are all impacted by the disabled persons functional levels including motion and general physical ability, with reduced prosthetic use, adversely affecting issues such as household income, social resources and high public consciousness. Williamson (1995) also suggests that the amputee suffers from feelings of vulnerability, being less able to defend themselves than those with greater mobility. Inherently this is dependent upon the amputee’s use of the prosthetic, with the implication being that satisfaction with their prosthetic is dependent on a greater combined use of the other three variables under investigation during this study, fit, comfort, and practicality.

Following this introduction, each of the main propositions, that is (i), (ii), (iii) and (iv), will firstly be related to each sub-variable (derivation) namely:

- Patient location.
- Age.
- Gender or sex.
- Level of amputation.
- Education Level.
- Approximate income.
• Pre and post amputation
• Approximate income.
• Pre and post amputation

These terms are explored according to their relationship with the associated tertiary variables assessed via the final questionnaire. This will be illustrated through the strongest associated variables at 0.00 significance level (100% confidence), due to the number of statistically relevant variables at 100% confidence.

These correlation’s with this level of significance can be regarded as being based in fact and not necessarily due to chance or variation within the sample. As a result this will allow for the explanation of predictors for prosthetic use and therefore producing a basis for the indicating the patients level of satisfaction with their prosthetics and service as a whole.

8.2 Independent Variables

These independent variables or derivations can be classified in two broad but distinctive group (i) and group (ii).

Concerned with issues, which can be counted as being irrespective of disability, this group facilitated the means by which to build up a profile of the person rather than the patient. Although brief in its formulation, indications of lifestyle prior to the life changing event of amputation were revealed and allowed for the forecasting of
possible aspirations should they have not become disabled, both of which factors add to the disclosure of possible patient satisfaction or dissatisfaction.

Concentrating life elements that may have affected the amputee following the loss of a limb, areas were presented that may greatly impact the patients satisfaction with their prosthesis, especially in terms of the external effect of becoming an amputee, such as loss or reduction in earnings.

These variables also allowed for a means of comparison between the patients lifestyle pre and post event, thus indicating even further possible repercussions of limb loss with respects of its impact on patient prosthetic satisfaction.

8.3 Dependent Variables

Comprehensively explained within the methodology chapter Fishman (1959) presents his view of seven main human needs common to amputees and Oppenheim’s (1966) “Questionnaire design and attitude measurements”, formed the basis for identifying areas of interest and structuring the investigation of this study. Thus allowing for focused questioning and measurement of the main variables of fit comfort and practicality.

8.4 Variables Relationships

The analysis of the relationships between the objective and subjective measurements has been achieved by means of frequencies (con descriptive), crosstabulations and
correlation’s (association’s) statistical techniques. Crosstabulations with Chi-square test of independence were used to assess the dependence or independence of an association.

Crosstabulations were used as an initial step so as to identify any association or potential grounds for a relationship between variables under testing. The results of these correlation’s in particular reference to questions with a strong significance but below the 100% confidence can be viewed according to main variable accusation in the previous chapter.

These findings gathered from the crosstabulations revealed that there appears to be a general relationship between the sub-variables and the main variables under investigation and in turn patient satisfaction with their prostheses. This will now be discussed in terms of the propositions that were found to be significant both in terms of statistical efficacy and in terms of patient interest.

8.5 The Propositions – The Relationship between Patient Prosthetic Satisfaction Via the Crosstabulation of Sub and Tertiary Variables.

By crosstabulating the sub variables and the tertiary variables illustrated in the previous chapter according to their classification under the main variables of fit, comfort, practicality and the later identified variable of communication, the results obtained suggested several actual relationships, and not evident from statistical or sampling anomalies. Using 0.00 significance level (100% confidence) and with a chi-square value above 9.49 and 4 degrees of freedom significant correlation’s were
identified which were then subjected to the non-parametric tests, these will be
illustrated below.

8.5.1 **Proposition Under the Main Variable of Fit – The Relationship between the
Main Variable of Fit and The Propositions attributed to the Sub-Variables.**

Proposition 1a, location: *The relationship between the main variable of fit and patient
prosthetic satisfaction within the sub-variable of the location of the limb fitting centre
in attendance.*

States that dependent on the location of the limb fitting centre the patient may be
more or less satisfied with the fit of their prosthesis.

The related sub-propositions are as follows: -

(a) Sub-proposition 1a– The frequency by which the patient requires or is
prescribed a new/replacement prostheses depends on the location of the limb
fitting centre that the patient is in attendance.

(b) Sub-proposition 1b– Depending on the location of the limb fitting centre the
patient attends, the greater or lesser the patients perception that their prosthesis
hampers their movement with regards to fit being the main cause.

(c) Sub-proposition 1c– Patients responses as to the their perceived walking
ability or whether they felt that they walked well depends on the location of
the limb fitting centre that they attend.
Proposition 1b, Sex: *The relationship between the main variable of fit and patient prosthetic satisfaction within the sub-variable of patient sex.*

This proposition states that the sex of the patient impacts on their level of satisfaction with the fit of their prosthesis, due to the differing requirements and demands of gender.

The related sub-proposition is as follows:

(a) Sub-proposition 1a– States that the patients sex in connection with the age at which the patient lost their limb may impact on their satisfaction with their prosthetic.

This association with particular relevance to its fit, had 100% confidence of a relationship between the two variables with a (Chi – square = 26.667, significance = 0.00). Due to the strength of this apparently significant relationship two non-parametric tests (Kendall tau-b =-.02) and (Spearman’s roe =-.06) were conducted, which indicated no association of significance to this study.

However, the data in its raw form suggests that there are predominantly more male amputees than females at all ages, this may be as a result of increased frequencies of cardiovascular heart disease within the male population. Implying that the patient’s level of satisfaction may be impacted by concomitant issues predominantly associated to the male gender. Although the non parametric tests indicate no association of interest to this study.
between the two variables. The variable implies that the patient’s sex in connection with the age at which they lost their limb has no impact on patients prosthetic satisfaction especially in relation to its fit.

The related sub-propositions: -

(b) Sub-proposition 1b– Suggests that the frequency by which the patient wears their prosthesis may be as a result of gender differences.

Proposition 1c, Age: The relationship between the main variable of fit and patient prosthetic satisfaction within the sub-variable of patient age.

This proposition states that the age of the patient at the time of limb loss will produce differing levels of satisfaction with their prosthesis, that is the older the patient the less satisfied they are likely to be with the fit of their prosthesis.

The related sub-proposition is as follows: -

(a) Sub-proposition 1a– States that the age at which the patient lost their limb may have an impact on patient satisfaction.

This relationship with particular relevance to its fit demonstrated a 100% confidence of a relationship between the two variables with a (Chi – square = 163.714, significance = 0.00). Therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.71) and (Spearman’s rho = 0.81) which indicated the relationship to be strong and as such significant.
Therefore it is suggested that the greater the duration between the time the patient initially lost their limb and their current age, the more likely they are to be satisfied with their prosthetic’s fit. This it is suggested may be as a result of the patients understanding and acceptance of their predicament as an amputee increasing, the longer the time since amputation.

This may also be confirmed by the data with, 71.4% (10 out of 14) patients loosing their limb between the ages of 81 to 100, which again goes to suggest that the patient may be less satisfied with their prosthetics fit. This may be as a result of several factors including, that the patient has had less time to adjust, are more likely to have concomitant problems which impact fit and or maybe too frail to adjust physically or mentally to the strain of amputation and prosthetics use.

(b) Sub-proposition 1b- The reason for amputation in conjunction to the patients age can create difficulties in the limb fitting process

The crosstabulation of the two variables seems to indicate that there is a 100% confidence of a relationship (Chi – square = 98.253, significance =0.00), therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.08) and (Spearman’s roe = 0.10). Although the strength of this relationship is weak the following inferences can be made.

The dominant reason for limb loss can be attributed to illness, with the associated concomitant problems having a negative impact on the patient’s
satisfaction with the fit of their prosthesis. Patients who reported in this manner were aged between 41 and 100, which may suggest an increased susceptibility of amputation during this time period. Therefore this association is in the affirmative.

(c) Sub-proposition 1c- The level of amputation in conjunction to the patients age can result create difficulties in the limb fitting process.

Proposition 1d, Level of education: *The relationship between the main variable of fit and patient prosthetic satisfaction within the sub-variable of patient education level.*

This proposition states that the higher the level of patient education the more likely they are to be able to communicate there needs and therefore receive the required fit from their prosthetic.

The related sub-propositions are as follows: -

(a) Sub-proposition 1a- The education level of the patient as a result of being disabled since birth can be affected due to the potential time away from education through treatment.

(b) Sub-proposition 1b- The education level of the patient may be reduced as a result of the limiting effect of wearing a prosthesis.
Proposition 1e, Income level pre disability: *The relationship between the main variable of fit and patient prosthetic satisfaction within the sub-variable of the patients income level pre disability.*

This proposition states that the income level of the patient prior to becoming disabled is likely to be higher than after becoming disabled.

The sub-propositions are as follows:

(a) Sub-proposition 1a- The frequency of limb replacement is in relation to the patients lifestyle.

(b) Sub-proposition 1b- The income level of the patient is affected due to the loss of earnings resultant from the frequency and time that the patient spends in treatment and its affect on career progression.

Proposition 1f, Level of amputation: *The relationship between the main variable of fit and patient prosthetic satisfaction within the sub-variable of the patients level of amputation.*

This proposition states that the level of amputation will result in varying degrees of patient quality of life and therefore patient satisfaction with their prostheses.

The related sub-propositions are as follows:

(a) Sub-proposition 1a- The level of amputation experienced by the patient may be as a result of the patients age at the time of amputation.
(b) Sub-proposition 1b- The patients level of amputation may hamper their movement as a result of the amputation extent or which limbs they lost.

Proposition 1g, Income level pre disability: The relationship between the main variable of fit and patient prosthetic satisfaction within the sub-variable of the patients income level post becoming disabled.

This proposition states that the income level of the patient after becoming disabled is likely to be lower than before becoming disabled.

The sub-propositions are as follows:

(a) Sub-proposition 1a- As a result of the patients requirement of removing their prosthesis due to pain/discomfort the are limited to the type of job/career they are able to do, thus their earning potential is reduced.

(b) Sub-proposition 1b- The additional costs of being disabled put a greater strain on the financial aspects of patients than those without disabilities.

Proposition 1h, Occupation pre-disability: The relationship between the main variable of fit and patient prosthetic satisfaction within the sub-variable of the patient's occupation pre disability.

This proposition is concerned with the issue of patients occupation prior to becoming disabled and whether or not they were forced to change their occupation as a result of disability.
The sub-propositions are as follows:

(a) Sub-proposition 1a- The number of appointments required to fit a prosthesis restricts the career opportunities due to the loss of working attendance.

The crosstabulation of these variables seems to suggest that there is a relationship between the patients occupation before limb loss and the number of appointments that it takes to fit them with a new prosthetic (Chi – square = 103.657, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables, therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.13) and (Spearman’s rho = 0.17).

Although the relationship between the two variables appears to be weak it is fair to suggest the following inferences.

The patient occupation prior to becoming disabled may have a baring on the number of appointments that they undertake in order to receive a suitable prosthetic, for the following reason. Patients who expressed that it took more than 8 appointments to receive a suitable prosthetic with the desired fit were generally from occupations that it can be suggested require a higher level of education than the others assessed and may therefore have higher expectations and levels of satisfaction. Additionally these respondent groups, skilled workers, office workers and professionals are more likely to be less easily pleased with poor or unsuitable prosthetics and are as a result more inclined to communicate their requirements until entirely satisfied with the prosthetics fit.
(b) Sub-proposition 1b- The time that a patient is able to walk within their prosthesis can affect their job and career progression.

These two variables suggest the following relationship (Chi – square = 125.248, significance = 0.00), this suggests a 100% confidence of a relationship between the two variables, therefore it was subjected to the non-parametric tests (Kendall tau-b = -0.09) and (Spearman’s rho = -0.13) which indicated little relevance due to the extreme likelihood that there is no relationship between the patients occupation prior to becoming disabled and the time that they are able to walk in a normal day.

Proposition 1i, Occupation post disability: The relationship between the main variable of fit and patient prosthetic satisfaction within the sub-variable of the patient’s occupation post disability.

This proposition states that occupation post disability is often changed or lost as a result of inability to fulfil a role within the workplace.

The sub-propositions are as follows: -

(a) Sub-proposition 1a- The reason for limb loss has an effect on the type of work that the patient can participate in following becoming disabled.
8.5.2 **Proposition Under the Main Variable of Comfort – The Relationship between the Main Variable of Comfort and The Propositions attributed to the Sub-Variables.**

Proposition 2a, location: The relationship between the main variable of comfort and patient prosthetic satisfaction within the sub-variable of the location of the limb fitting centre in attendance. This proposition states that dependent on the location of the limb fitting centre the patient may be more or less satisfied with the level of comfort attained from their prosthesis.

The related sub-propositions are as follows:

(a) **Sub-proposition 1a**– The prescription of the limb and therefore the design differs according to the location of the limb fitting centre in attendance.

(b) **Sub-proposition 1b**– The patients perception of their walking ability differs subject to their type of amputation.

Proposition 2b, Sex: *The relationship between the main variable of comfort and patient prosthetic satisfaction within the sub-variable of patient sex.*

This proposition states that the sex of the patient impacts on their level of satisfaction with the comfort of their prosthesis. Additionally it also states that the sex of the patient may result in different levels of reported tolerable to discomfort.
The related sub-propositions are as follows:

(a) Sub-proposition 1a- If the patient has been disabled since birth the prognosis may be affected by the sex of the patient, and prove to be a more or less of a handicap.

(b) Sub-proposition 1b- The sex of the patient relates to their ability and or willingness to participate in sporting activities.

(c) Sub-proposition 1c- The occurrence of problems pertaining to the limb fitting process varies in accordance to the patients sex.

Proposition 2c, Age: The relationship between the main variable of comfort and patient prosthetic satisfaction within the sub-variable of patient age.

This proposition states that the comfort level of the prosthesis may be affected by the age of the patient.

The related sub-propositions are as follows:

(a) Sub-proposition 1a- Suggests that the age of the patient limits their sporting activity due to the comfort of the prosthesis.

(b) Sub-proposition 1b- The older the patient the more likely the prosthesis is to negatively affect their stump, in terms of soreness, rubbing and allergic reactions.

Proposition 2d, Level of education: The relationship between the main variable of comfort and patient prosthetic satisfaction within the sub-variable of patient education level.
The suggestion of this proposition is that it is likely that the education level of the patient could effect their ability to communicate and problems with the comfort of the prosthesis.

The related sub-propositions are as follows:

(a) Sub-proposition 1a- Suggests that the education level of the patient can potentially limit their ability to report any affect that prostheses has on their stump.

(b) Sub-proposition 1b- Implies that the length of time that the patient wears their prosthetic is as a result of lower expectance levels or in other words “the limb fitter knows best and I can not expect any better”.

Proposition 2e, Income level pre disability: The relationship between the main variable of comfort and patient prosthetic satisfaction within the sub-variable of the patients income level pre disability.

This proposition states that the income level of the patient prior to becoming disabled has an effect on the levels of comfort the patient will accept.

The related sub-propositions are as follows:

(a) Sub-proposition 1a- The patient’s income can be affected according to the age at which they became disabled.
Proposition 2f, Level of amputation: *The relationship between the main variable of comfort and patient prosthetic satisfaction within the sub-variable of the patients level of amputation.*

This proposition states that the limb the patient lost (level of amputation) has a direct effect on the patient's levels of comfort within the prostheses.

The related sub-propositions are as follows:

(a) Sub-proposition 1a- States that the limb that the patient lost depends on the reason for the disabilities occurrence.

The results of the two variables, the reasons for patient limb loss and the associated absent limb/s seem to suggest a relationship (Chi-square = 32.608, significance = 0.00) this suggests 100% confidence of a relationship between the two variables, therefore it was subjected to the non-parametric tests (Kendall tau-b = -.18) and (Spearman's rho = -.20) but implied no significant relationship.

The lack of a significant relationship suggests that the comfort of the prosthetic is not impacted by the limb lost and the reason for its loss. It implies that the differing reasons and limbs lost are not indicators of potential patient satisfaction or potential problems with the comfort of the prostheses.

(b) Sub-proposition 1b- States that the level of amputation can impact on the number of weeks that it takes to fit the patient with a new prostheses.
(c) Sub-proposition 1c- States that the lower the quality of the prostheses in terms of comfort the less the patient feels they are able to walk acceptably.

Proposition 2g, Income level post disability: *The relationship between the main variable of comfort and patient prosthetic satisfaction within the sub-variable of the patients income level post becoming disabled.*

This proposition states that the income level post disability can effect the level of satisfaction with their prostheses comfort.

The related sub-propositions are as follows:

(a) Sub-proposition 1a- States that the number of weeks that it takes the patient to be fitted with a new prostheses can be affected by their income level as they accept prostheses early when they are not correctly fitted.

The suggested relationship between the variables is (Chi – square = 105.862, significance = 0.00) indicating a 100% confidence of a relationship between the two variables, therefore it was subjected to the non-parametric tests (Kendall tau-b = 0.04) and (Spearman’s roe = 0.05), which confirmed the existence of a relationship all be it a weak one.

This variable may suggest however, that due to the fear of loss of earnings patients may be more willing to accept a prosthetic that is not wholly suitable or is ill-fitting. Additionally, the patient’s income may have been affected as a result of them having a prosthetic limb. This it is suggested is due to the time
spent in a limb-fitting center away from work in order to be fitted with a suitably comfortable prosthetic limb.

(b) Sub-proposition 1b- States that patients would be more satisfied if they had an alternative to stump socks.

This variable although having a relatively small response rate indicates the following relationship between the variables (Chi – square = 94.885, significance = 0.00) this suggests a 100% confidence of a relationship between the two variables. This is based on the following results. Therefore it was subjected to the non-parametric tests (Kendall tau-b = -.16 ) and (Spearman’s roe = -.19 ) which indicated that there was no association.

Although the results and suggestions are based on the 8 out of 60 respondents that commented on the use of stump socks the information suggests that the use of stump socks is of little inconvenience. The reasoning behind this can be expanded further than the respondent’s replies.

Proposition 2h, Occupation pre disability: The relationship between the main variable of comfort and patient prosthetic satisfaction within the sub-variable of the patients occupation pre disability.

This statement suggests that the patient’s occupation pre disability is likely to be change as a result of the comfort levels attributed to the prostheses
The related sub-propositions are as follows:

(a) Sub-proposition la- States that the duration the patient is able to walk can result in the occupation of the patient changing, due to the fatigue attributed to wearing a prosthesis.

These relationship at (Chi – square = 125.248, significance = 0.00), suggests a 100% confidence of a relationship between the two variables. Therefore it was subjected to the non-parametric tests (Kendall tau-b = -.09) and (Spearman’s roe = -.13) which again indicated no association between the variables under testing and as such of no significance to this study.

Proposition 2i, Occupation post disability: *The relationship between the main variable of comfort and patient prosthetic satisfaction within the sub-variable of the patient’s occupation post disability.*

This proposition states that the disability of the patient has an effect on their occupation as a result of comfort levels attributed to the prosthesis.

The related sub-propositions are as follows:

(a) Sub-proposition 1a- States that the material the prosthesis is made from can adversely affect the patients ability to sufficiently undertake the job they had prior to becoming disabled, often as a result changing career or retiring.

(b) Sub-proposition 1b- States that the patient’s perception of the limbs comfort level can differ according to the nature of the changes attributed to becoming disabled.

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8.5.3 Proposition Under the Main Variable of Practicality – The Relationship
between the Main Variable of Practicality and The Propositions attributed to
the Sub-Variables.

Proposition 3a, location: The relationship between the main variable of practicality
and patient prosthetic satisfaction within the sub-variable of the location of the limb
fitting centre in attendance.

This proposition states that the level of practicality achievable from the prostheses can
vary depending on the limb fitting centre in attendance.

The related sub-propositions are as follows: -

(a) Sub-proposition 1a- States that the location of the limb fitting centre in
attendance impacts the patients experience of sporting activities.

This relationship (Chi – square = 16.596, significance = 0.00), suggests a
100% confidence of a relationship between the two variables. Therefore it was
subjected to the non-parametric tests (Kendall tau-b = -.50 ) and (Spearman’s
roe = -.52 ) which indicated a weak relationship.

However from this variable it can be suggested that all of the respondents
from both locations have been limited with respect to sporting experiences.
This it is suggested may be due to the practicality of the prosthetic in several
ways, including. Prosthetics are often heavy, requiring large amounts of
energy to undertake any activity especially sporting. They often cause the patient to suffer from soreness and rubbing, which can be exacerbated through strenuous exercise. Finally the general NHS prosthetics that are prescribed within both locations can be refereed to as utilitarian due to the fact that they are designed to be used in a multitude of activities. As a result specialised prosthetics have been designed to facilitate the patient in sporting activities. Such prosthetics are made from specialised materials, have reduced features and are generally designed to cater for the particular sport, with prosthetics specially designed for running, swimming and skiing being available at a cost. Due to this may patient with NHS prosthetics often feel limited by the practicality of their prosthetic.

(b) Sub-proposition 1b- States that the location of the limb fitting centre in attendance impacts choice of technology used to fabricate the prostheses.

Proposition 3b, Sex: The relationship between the main variable of practicality and patient prosthetic satisfaction within the sub-variable of patient sex.

This proposition states that the sex of the patient has implications on the practicality of wearing the prostheses.

The related sub-propositions are as follows: -

(a) Sub-proposition 1a- States that the patients sex effects the rate at which they need new prosthetic limbs.
(b) Sub-proposition 1b- Suggests that the sex of the patient has an impact on the frequency by which they wear their prostheses.

Proposition 3c, Age: The relationship between the main variable of practicality and patient prosthetic satisfaction within the sub-variable of patient age.

This proposition states that the practicality of the prosthesis has differing impacts on the patient at different ages

The related sub-propositions are as follows:

(a) Sub-proposition 1a- States that the age of the patient can affect the length of time they spend putting their prostheses on

(b) Sub-proposition 1b- States that the older the patient the longer it takes them to put the prostheses on.

Proposition 3d, Level of education: The relationship between the main variable of practicality and patient prosthetic satisfaction within the sub-variable of patient education level.

This proposition states that the achieved practicality of wearing a prosthesis can be affected by the education level of the patient.

The related sub-propositions are as follows:

(a) Sub-proposition 1a- The better educated the patient the less willing they are to settle for inadequate limbs due to technology.
(b) Sub-proposition 1b- The education level of the patient may result in them requiring help to put on their prostheses.

Proposition 3e, Income level pre disability: The relationship between the main variable of practicality and patient prosthetic satisfaction within the sub-variable of the patient’s income level pre disability.

The patient’s income level before becoming disabled is likely to be affected as a result of the practicality of the prosthesis.

The related sub-propositions are as follows: -

(a) Sub-proposition 1a- The income level of the patient is likely to be higher before disability than since due to factors such as the reasons for removing prosthesis.

Proposition 3f, Level of amputation: The relationship between the main variable of practicality and patient prosthetic satisfaction within the sub-variable of the patients level of amputation.

This proposition states that the amputation level of the patient impacts on the practicality of the prostheses.

The related sub-propositions are as follows: -

(a) Sub-proposition 1a- The level of amputation is further exasperated by the type of amputation.
(b) Sub-proposition 1b- The frequency by which the patient can walk is effected by the level of amputation.
(c) Sub-proposition 1c- The longevity of prosthesis wear time is effected by the amputation type.

Proposition 3g, Income level post disability: *The relationship between the main variable of practicality and patient prosthetic satisfaction within the sub-variable of the patients income level post becoming disabled.*

This statement suggests that the income level post disability is likely to be lower than pre disability as a result of the prosthesis's practicality.

The related sub-propositions are as follows: -

(a) Sub-proposition 1a- The patients income level post disability dictates whether they wear stump socks or some other more advanced stump covering.
(b) Sub-proposition 1b- The duration by which the patient can walk since becoming disabled is reduced as a result of their disability.
(c) Sub-proposition 1c- The patients ability to walk is reduced since becoming disabled.

Proposition 3h, Occupation pre disability: *The relationship between the main variable of practicality and patient prosthetic satisfaction within the sub-variable of the patients occupation pre disability.*
This proposition states that the disabled person's occupation is likely to change as a result of the practicality of wearing a prosthesis.

The related sub-propositions are as follows:

(a) Sub-proposition 1a- Suggests a relationship between the patient's occupation pre-amputation and the time it took them to put on their prosthesis.

(b) Sub-proposition 1b- Suggests that there is a link between the patient's occupation pre-amputation and whether they take longer than five minutes to put on their limb.

Proposition 3i, Occupation post disability: The relationship between the main variable of practicality and patient prosthetic satisfaction within the sub-variable of the patient's occupation post disability.

This proposition suggests that the patient's occupation post amputation is affected by the practicality of the prosthesis.

The related sub-proposition is as follows:

(a) Sub-proposition 1a- The occupation of the patient post-amputation can be affected as a result of the number of times that they removed their prosthesis in a single day.

These results seemed to suggest that there is a relationship between the patient being a part of a disabled organisation and whether they question the limb fitter (Chi-square = 115.400, significance = 0.00), or 100% confidence of no
relationship. This was confirmed by subjection to the non parametric tests, (Kendall tau-b = 0.36, Spearman’s roe = 0.38).

The strength of the association was moderate. This data infers that the occupation of the patient post amputation is likely to be affected. This may be as a result of increased energy expenditure attributed to the prosthetics, access issues within the working environment or even health and safety issues connected with the patient’s career.

8.6 Cross Tabulated Results

The results of the crosstabulations conducted on each of the above suppositions indicated the following significant correlation’s in accordance to with the main variables under test namely fit, comfort, and practicality. The corresponding Chi-square, Kendall tau-b and Spearman’s roe tests will now be illustrated in table form.
### Table 1: Fit

<table>
<thead>
<tr>
<th>Variables Crossed (Fit)</th>
<th>Sub-Sub Variable (Tertiary)</th>
<th>Value Chi-Square</th>
<th>Asymp.Sig Chi-Square</th>
<th>Kendall's Tau-b</th>
<th>Spearman's n's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Sex</td>
<td>Age at time of limb loss</td>
<td>26.667</td>
<td>0.00</td>
<td>-.02</td>
<td>-.06</td>
</tr>
<tr>
<td>Patient Age</td>
<td>Age at time of limb loss</td>
<td>163.714</td>
<td>0.00</td>
<td>0.71</td>
<td>0.81</td>
</tr>
<tr>
<td></td>
<td>Reason for limb loss</td>
<td>98.253</td>
<td>0.00</td>
<td>0.08</td>
<td>0.10</td>
</tr>
<tr>
<td>Occupation Before</td>
<td>Fitting duration (appointments)</td>
<td>103.657</td>
<td>0.00</td>
<td>0.13</td>
<td>0.17</td>
</tr>
<tr>
<td></td>
<td>Time able to walk</td>
<td>125.248</td>
<td>0.00</td>
<td>-.09</td>
<td>-.013</td>
</tr>
</tbody>
</table>

### Table 2: Comfort

<table>
<thead>
<tr>
<th>Variables Crossed (Comfort)</th>
<th>Sub-Sub Variable (Tertiary)</th>
<th>Value Chi-Square</th>
<th>Asymp.Sig Chi-Square</th>
<th>Kendall's Tau-b</th>
<th>Spearman's n's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Which limb did you lose (Level of Amputation)</td>
<td>Reason for limb loss</td>
<td>32.608</td>
<td>0.00</td>
<td>-.18</td>
<td>-.20</td>
</tr>
<tr>
<td>Income Since Disability</td>
<td>Fitting duration (weeks)</td>
<td>105.862</td>
<td>0.00</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>No stump socks easier</td>
<td>94.885</td>
<td>0.00</td>
<td>-.16</td>
<td>-.19</td>
</tr>
<tr>
<td>Occupation Before</td>
<td>Time able to walk</td>
<td>125.248</td>
<td>0.00</td>
<td>-.09</td>
<td>-.13</td>
</tr>
</tbody>
</table>

### Table 3: Practicality

<table>
<thead>
<tr>
<th>Variables Crossed (Practicality)</th>
<th>Sub-Sub Variable (Tertiary)</th>
<th>Value Chi-Square</th>
<th>Asymp.Sig Chi-Square</th>
<th>Kendall's Tau-b</th>
<th>Spearman's n's</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limb Fitting Centre In Attendance (Location)</td>
<td>Limit chances (sport)</td>
<td>16.596</td>
<td>0.00</td>
<td>-.50</td>
<td>-.52</td>
</tr>
<tr>
<td>Occupation Since</td>
<td>Why take of limb</td>
<td>115.400</td>
<td>0.00</td>
<td>0.36</td>
<td>0.38</td>
</tr>
</tbody>
</table>
Through the identification of the communication variable in the latter stages of this study, the previously investigated variables of fit, comfort and practicality, although of significance, were considered lesser indicators of patient prosthetic satisfaction. As the variable of communication proved to have more statistical significance due to the high numbers of significant relationships between the variable and the combined sub and tertiary variables, significant at 100% confidence or 0.00.

The use of the 100% significance level was decided as the number of significant relationships at the usual level of 95% confidence was very high and therefore far beyond the scope and range of this study but could be used as a basis for further exploration. The table 4 presented on page 362 and found in Appendix E illustrates the results of the various tests performed on the communications variable and the results obtained followed by an explanation of the suppositions with the greatest importance.

As applied to the previous sections regarding fit, comfort and practicality the findings connected with the identified variable of communication gathered from the crosstabulations revealed general relationships between the sub-variables and the main variables under investigation and in turn patient satisfaction with their prostheses. This will now be discussed in terms of the propositions that were found to be significant statistical at the level of 100% confidence of a relationship according to Chi square and Kendall tau-b and Spearman’s roe with particular reference to the later
identified main variable of communication. These statistical findings will then be illustrated in table form.

8.7.1 Proposition Under the Main Variable of Communication – The Relationship between the Main Variable of Communication and The Propositions attributed to the Sub-Variables of (Do you ask questions of your limb fitter).

*The relationship between the main variable of communication and patient prosthetic satisfaction within the sub-variable of the patients questioning the limb fitter (knowledge and interaction)*

This proposition states that the manner by which the patient interacts with the limb fitter and the establishment of rapport impacts on levels of patient satisfaction, including the previously expressed and investigated variables of fit, comfort and practicality.

Patients were asked about their overall attitude towards questioning and general interaction with their prosthetist. Crosstabulations of the whole response 60 in total, (30 patients from each of the limb fitting centres namely Leicester and Luton), who completed the questionnaire were used. From the crosstabulations table it was evident that there was an association between the patients questioning and of the limb fitter and their level of satisfaction with their protheses (Chi – square = 35.357, significance .000). Actual strength calculated by significance levels of Spearman’s roe and Kendall tau-b two non-parametric correlation coefficients showed the
relationship to be of moderate strength \( (\text{Kendall tau-b} = 0.53) \) and \( (\text{Spearman's rho} = 0.55) \).

Having established that there was an association between the variables and thus a strong relationship using a significance level of 0.00 (100% confidence). The study investigated the relationship between the overall level of patient prostheses satisfaction and the patient questioning/conversing with their prosthetist. This test was undertaken to identify whether any of the variables within the envelope of communication were worth investigation. As a result, the following relationships have been explained via the sub-propositions.

The related sub-propositions are as follows:

(a) Sub-proposition 1a- The patients ability to communicate issues with the prostheses and or their disability satisfactorily may be impacted by their participation or attendance of disability organisations.

The results of the crosstabulations conducted within both hospital limb-fitting centres namely Leicester and Luton & Dunstable are as follows. Responses to the questioning of patients membership of a disabled organisation and their active questioning of their prosthetist so as to accurately communicate their requirements, infers a moderate relationship between the two variables. Due to the greater number of patients who did question their prosthetist being a member of some form of disabled organisation.
These findings reinforce the existence of a relationship between the two variables that is, the patient's ability to communicate issues with the prostheses/disability to the prosthetist may be impacted by their attendance of disability organisation due to their likely personal knowledge regarding their situation.

The statistical results, (Chi-square = 27.300, significance .000) showed an apparent association, confirmed by the non-parametric tests, (Kendall tau-b = 0.36) and (Spearman's rho = 0.38) which indicated the strength of the association to be moderate.

This apparent relationship may be created by the likelihood of the patient's knowledge being increased due to increased contact with people in similar situations, which facilitates the exchange of information and advice. Generally acting as a patient support network thus increasing patient awareness.

(b) Sub-proposition 1b- The patient's knowledge of their situation as an amputee and as a disabled person impacts on their ability to communicate with the limb fitter.

Patients in both locations were asked about their overall attitude towards questioning their prosthetist and their general level of knowledge regarding their disability and prostheses. Patients that responded affirmatively that they
did question their limb fitter reported generally higher levels of knowledge than those who did not (Chi – square = 48.513, significance .000).

Suggesting a relationship between patient knowledge levels and their ability or willingness to ask questions regarding their treatment apparently confirmed by (Kendall tau-b = 0.15) and (Spearman’s roe = 0.18) which indicates a weak association.

This relationship although weak indicates that patient knowledge of their situation as an amputee and as a disabled person impacts on their ability to communicate with the limb fitter. That is the better the patient’s knowledge of their predicament, the more able the patient to relaying complaint and describe problems with their prosthetic. Therefore facilitating the prosthetist to accurately alter the prosthetic to the requirements of the patient.

(c) Sub-proposition 1c- Patients that have received walking training are better equipped to communicate issues of importance with their prostheses.

From this data it is fair to suggest that patients who had received walking training were more likely to ask their limb fitter questions than those who did not. The suggested relationship is therefore (Chi – square = 68.333, significance = 0.00) at 100% confidence of a relationship. Indicating that the patients who had received walking training were better able to communicate issues of importance to their limb fitter. This was confirmed by, (Kendall tau-b
= 0.57, Spearman’s roe = 0.40) two non parametric tests which indicated a moderate relationship.

This increased ability to communicate with the limb fitter could be due to the experience of walking training in which the patient is re-educated following amputation to walk in their prosthetic. During this process the physiotherapist would explain processes such as the patients walking gait in terms that the patient is more likely to understand, therefore increasing their vocabulary and understanding of their situation.

(d) Sub-proposition 1d- Patients that have received life coaching are better equipped to communicate issues of importance with their prostheses.

From this data it is fair to suggest that patients who had received life coaching were more likely to ask their limb fitter questions than those who did not. The relationship is suggested by (Chi – square = 60.008, significance = 0.00) at 100% confidence of a relationship. However the two non-parametric tests, (Kendall tau-b = 0.36, Spearman’s roe = 0.38) indicated a moderate association.

This relationship again similarly to the previous sub-proposition suggests that should the patient receive life coaching they may be informed or receive explanations of terminology during the life coaching classes which they could use during conversations with the prosthetist to explain issues attributed to the prosthetic.
(e) Sub-proposition 1e- Patients that have received disablement counselling are better equipped to communicate issues of importance with their prostheses.

From this data it is fair to suggest that patients who received disablement counselling, were better equip to communicate with their limb fitter. This relationship at (Chi - square = 60.000, significance = 0.00) at 100% confidence was confirmed by, (Kendall tau-b = 0.48, Spearman’s roe = 0.50) two non parametric tests which indicated a moderate relationship between the two variables.

It can be implied from the data that should the patient be presented with disablement counselling they are more likely to be better equipped to inform the prosthetist of problems and therefore help the prosthetist to make a limb that is satisfactory. Again this is possibly due to the likely increase of vocabulary gained from receiving disablement counselling.

(f) Sub-proposition 1f- Patients that have received general disability information are better equipped to communicate issues of importance with their prostheses.

The results of the crosstabulations from the questioning of whether or not patients had received general information on their disability during their attendance at the limb fitting centre, was asked so as to establish if patients were better equipped to communicate issues of importance with their prostheses following this form of education.
The findings questioned whether a patient receiving general information on their disability could improve their chances of having a satisfactory prostheses, as a result of the level of gained education. From this data it is fair to suggest that patients who had received general disability information were more likely to ask their limb fitter questions than those who did not. This information implies that the availability of general disability information for the patient, increases patient prosthesis communication in turn improving deliverable prosthetic satisfaction. It is likely that this is due to the patient learning about their predicament as a result of the written information, in pamphlet or magazine form.

The results of the statistical tests (Chi – square = 60.606, significance .000 ). Showed an apparent association and the non parametric tests (Kendall tau-b = 0.39 ) and (Spearman’s rho = 0.41 ) confirmed a moderate association.

(g) Sub-proposition 1g- Patients that have received other forms of rehabilitation are better equipped to communicate issues of importance with their prostheses.

From this data it is fair to suggest that patients who had received other forms of disability information and rehabilitation counselling were more likely to ask their limb fitter questions than those who did not. The relationship is suggested through (Chi – square = 63.000, significance = 0.00) at 100% confidence, confirmed by, (Kendall tau-b = 0.40, Spearman’s rho = 0.41) which indicated a moderate association. This variable may imply that the
availability of information for the patient would increase patient prosthetist communication thus increasing prosthetic satisfaction.

(h) Sub-proposition 1h- Patients that have received counselling following amputation are better equipped to communicate issues of importance with their prostheses and or their disability.

This variable suggests patients who had received counselling about their disability were more likely to ask their limb fitter questions than those who did not. This variable may imply that the patients that have received disablement counselling are more able to understand their predicament and deal with the situation in a more productive and positive manner increasing prosthetic satisfaction. This is confirmed by (Chi – square = 47.640, significance = 0.00) at 100% confidence of a relationship and by, (Kendall tau-b = 0.34, Spearman’s roe = 0.36) which indicated a moderate association.

(i) Sub-proposition 1j- Patients that are included in all areas of the decision making process are more involved and therefore able to communicate their needs making them more satisfied with the delivered prostheses.

Patients were asked about how well they perceived they were included in all areas of the decision making process. The results on their involvement and their ability to communicate their needs thus making them more satisfied with the delivered prostheses. Seems to suggest a relationship, (Chi – square = 51.350, significance .000 ) or 100% (Kendall tau-b = 0.18) and (Spearman’s
These results suggest that there is a relationship between the patients' direct inclusion in the decision making process with regards to their satisfaction with their prostheses albeit a weak one.

(j) Sub-proposition 1k- Patients that are informed about all areas of the decision making process are more involved and therefore able to communicate their needs making them more satisfied with the delivered prostheses.

Patients were asked how satisfied they were with the way they had been informed at all stages of the limb fitting process by the prosthetist. This question examined the existence of a possible relationship between the manner or communication levels held between the patients and prosthetist. This was conducted to how well patients perceived they were informed about decisions, as this can be a good identifier of patient involvement. The question suggested that should the patient feel that decisions were made without their consent or basic involvement, their opinions and needs were ignored or overlooked thus impacting on patient satisfaction levels with the overall limb fitting process and inherently their prostheses.

From this data it is fair to suggest that patients who questioned their limb fitter felt that they were informed more about the decisions concerning their prosthetic than those who did not question the limb fitter. The suggested relationship is therefore (Chi - square = 51.952, significance = 0.00) at 100% confidence of a relationship.
This indicates that patients who are informed about all areas of the decision making process are more involved and therefore able to communicate their needs, making them more satisfied with the delivered prosthesis. This was confirmed by, (Kendall tau-b = 0.18, Spearman’s roe = 0.20) which indicated a weak association.

(k) Sub-proposition 11- Patients that are able to describe their needs and or issues with their prosthesis are more likely to be satisfied with their prosthesis.

Crosstabulations of this questioning suggested a relationship ( Chi – square = 57.167, significance .000 ) at 100% confidence between the two variables regarding the patients ability to accurately and coherently describe their requirements of the prosthesis to their limb fitter. The existence of a relationship indicated that there may be a link between the patients prosthesis satisfaction and their ability to describe issues of importance with the limb fitting process and their prosthesis. Indeed this question implies strongly that there is a need for a high level of communication between the two parties, namely the patient and prosthetist.

The non parametric tests also confirm a relationship between the variables (Kendall tau-b = 0.15) and (Spearman’s roe = 0.18) although a weak one.

(l) Sub-proposition 11- The better the patients requests are understood by the prosthesis the more easily their needs are satisfied and in turn patient prosthesis satisfaction.
Patients were asked how well they felt their descriptions of problems were understood by the prosthetist. This was questioned to establish how well the limb fitter responded and made alterations following instruction of discomfort by the patient. As inaccurate alterations or misunderstood complaint is likely to instigate negative reactions from both parties, thus impacting on patient prostheses satisfaction.

The crosstabulations suggested a relationship (Chi-square = 52.711, significance .000) with the use of non parametric testing indicated a weak association but concurred these findings (Kendall tau - b = 0.20) and (Spearman’s roe = 0.23).

(m) Sub-proposition 10- The proposition presumes that if the patient has been offered information on disability their knowledge may be improved and therefore their level of prosthetist communication thus improving patient prostheses satisfaction.

This data suggest that patients had received information on their disability and that had an impact on whether or not they asked the limb fitter questions. (Chi-square = 38.675, significance = 0.00) at 100% confidence of a relationship. These results suggested that received information would increase communication between patient and prosthetist. This was confirmed by, (Kendall tau-b = 0.26, Spearman’s roe = 0.28) two non-parametric tests which indicated a weak association.
Sub-proposition 1p- The proposition presumes that if the patient has been offered information on prostheses their knowledge may be improved and therefore their level of prosthetist communication thus improving patient prostheses satisfaction.

This data suggest that patients who have received information on their prosthetic responded that they did ask the limb fitter questions. (Chi – square = 49.942, significance = 0.00) at 100% confidence of a relationship. These results suggested that patients who had received information on their prosthetic were more inclined to communicate their needs to the prosthetist. This was confirmed by, (Kendall tau-b = 0.40, Spearman’s roe = 0.42) two non parametric tests which indicated a moderate association.

Sub-proposition 1q- The proposition presumes that if the patient has been offered information on the limb fitting process their knowledge may be improved and therefore their level of prosthetist communication thus improving patient prostheses satisfaction.

Patient were asked if they had ever been offered any information on the limb fitting process in general. The aim being to identify whether there was a correlation between the presence of information within the limb fitting centre and the overall level of prostheses communication through basic questioning by the patient.
These variables were used to indicate the connection between the availability of information from the limb fitting centre and the patients ability to communicate their needs and demands accurately and with a vocabulary that can relay their problems so as to facilitate the prosthetists corrections and alterations.

The crosstabulated results of this question suggested a relationship (Chi-square = 48.469, significance .000) of moderate strength through the use non-parametric tests (Kendall tau-b = 0.35) and (Spearman’s rho = 0.36).

These results suggested that the better the quality of disability information the better educated the patient is going to be about their situation. Increasing the likelihood of the patient is to communicate their needs to the limb fitter and the limb fitter understand and make alterations, thus increasing levels of prosthetic satisfaction.

Sub-proposition 1r- The proposition presumes that if the patient has been offered information on the amputee health care their knowledge may be improved and therefore their level of prosthetist communication thus improving patient prostheses satisfaction.

This variable suggest that if patients had received information about the amputee health care they would have been more likely to communicate their needs to the limb fitter. (Chi-square = 38.806 significance = 0.00) at 100% confidence of a relationship.
These results suggested that if patients had received information on the amputee health care they may have increased levels of prosthetic satisfaction, this was confirmed by, (Kendall tau-b = 0.28, Spearman’s røe = 0.29) two non parametric tests which indicated weak association.

(q) Sub-proposition 1s- The proposition presumes that if the patient has been offered information on disability their knowledge may be improved and therefore their level of prosthetist communication thus improving patient prostheses satisfaction. Providing it was of an informative quality to the patient making it a useful aide to communication.

Patient were asked if they had ever been offered any information on disability in general. The aim being to identify whether there was a correlation between the presence of information within the limb fitting centre and the overall level of prostheses communication through basic questioning by the patient.

These variables were used to indicate the connection between the availability of information from the limb fitting centre and the patients ability to communicate their needs and demands accurately and with a vocabulary that can relay their problems so as to facilitate the prosthetists corrections and alterations.
The crosstabulated results of this question suggested a relationship (Chi-square = 43.934, significance .000) although a weak one according to the nonparametric tests (Kendall tau-b = 0.29) and (Spearman’s rho = 0.31).

Sub-proposition 1t- The proposition presumes that if the patient has been offered information on prosthetics their knowledge may be improved and therefore their level of prosthetist communication thus improving patient prostheses satisfaction. Providing it was of an informative quality to the patient making it a useful aide to communication.

Patient were asked if they had ever been offered any information on prosthetics in general and whether it was of good general quality. The aim being to identify whether there was a correlation between the quality of information within the limb fitting centre and the overall level of prostheses communication through basic questioning by the patient.

These variables were used to indicate the connection between the availability of information from the limb fitting centre and the patients ability to communicate their needs and demands accurately and with a vocabulary that can relay their problems so as to facilitate the prosthetists corrections and alterations.

The crosstabulated results of this question suggested a relationship (Chi-square = 48.978, significance .000) although a weak one according to the nonparametric tests (Kendall tau-b = 0.26) and (Spearman’s rho = 0.29).
(s) Sub-proposition 1u- The proposition presumes that if the patient has been offered information on the limb fitting process their knowledge may be improved and therefore their level of prosthetist communication thus improving patient prostheses satisfaction. This is providing that the information was informative and of good quality to the patient making it a useful aide to communication.

Patient were asked if they had ever been offered any information on the limb fitting process in general and whether it was of good general quality. The aim being to identify whether there was a correlation between the quality of information within the limb fitting centre and the overall level of prostheses communication through basic questioning by the patient.

These variables were used to indicate the connection between the availability of information from the limb fitting centre and the patients ability to communicate their needs and demands accurately and with a vocabulary that can relay their problems so as to facilitate the prosthetists corrections and alterations. The crosstabulated results of this question suggested a of relationship ( Chi – square = 50.063, significance .000 ) of moderate strength through the use non parametric tests ( Kendall tau-b = 0.32 ) and ( Spearman’s roe = 0.35 ).

(t) Sub-proposition 1v- The proposition presumes that if the patient has been offered information on the amputee health care their knowledge may be
improved and therefore their level of prosthetist communication, thus improving patient prostheses satisfaction, providing it was good quality and informative to the patient making it a useful aide to communication.

Patients were asked if they had ever been offered any information on amputee health care in general and whether it was of good general quality. The aim being to identify whether there was a correlation between the quality of information within the limb fitting centre and the overall level of prostheses communication through basic questioning by the patient.

These variables were used to indicate the connection between the availability of information from the limb fitting centre and the patients ability to communicate their needs and demands accurately and with a vocabulary that can relay their problems so as to facilitate the prosthetists corrections and alterations.

The crosstabulated results of this question suggested a relationship ( Chi-square = 43.028, significance .000 ), although a weak one according to the non parametric tests ( Kendall tau-b = 0.28 ) and ( Spearman’s rho = 0.30 ).

Sub-proposition 1w- The proposition states that if the patient has never received any information on any area of their disability or prostheses in general that they would consider such information a useful aid to their knowledge, thus facilitating communication and their ability to achieve their desired level of comfort prostheses satisfaction.
This data suggest that if the limb fitting centres supplied any information on disability, prostheses, the limb fitting process or amputee health care patients would find it useful (Chi – square = 61.887, significance = 0.00) at 100% confidence of a relationship. These results suggested that if information was provided to the patient the better educated the patient would be about the situation and the more likely the patient would be able to satisfactorily communicate their needs to the limb fitter. Thus facilitating the limb fitter to accurately make and alter the patients prosthetic, therefore increasing levels of patient prosthetic satisfaction. This was confirmed by, (Kendall tau-b = 0.27, Spearman’s rho = 0.29) two non parametric tests which indicated a weak association.

(v) Sub-proposition 1y- The proposition states that if the patient has received any information on the choice of prostheses available to them then they are more likely to be feel included in the decision making process and therefore be more generally satisfied.

This relationship suggest that the better equip the patient is with information about the availability of prosthetics the more able they are to converse with the limb fitter and achieve higher levels of prosthetic satisfaction. (Chi – square = 50.589, significance = 0.00) at 100% confidence of a relationship. This was confirmed by, (Kendall tau-b = 0.42, Spearman’s rho = 0.44) two non parametric tests which indicated a moderate association.
Sub-proposition 1z - The proposition states that presenting the patient with any information on the choice of prostheses available to them they are more likely to be able to make informed commentary on their delivered prostheses and constructive criticism.

This data suggest that if the limb fitting centres supplied any information on available prosthetics the patient would be very interested. (Chi – square = 35.922, significance = 0.00) at 100% confidence of a relationship. These results suggested that if information was provided the patient would be better educated as to availability and suitability and the more satisfied with their current situation and prosthetic. This was confirmed by, (Kendall tau-b= 0.42, Spearman’s rho = 0.44) two non parametric tests which indicated a moderate association.

Sub-proposition 2a - The proposition states that the frequency by which the patient requires a new prostheses can be influenced by patient limb fitter communications.

This data suggest that if the patient questions the limb fitter the frequency of prosthetic replacement is increased. That is that the more the patient indicates issues of concern such as rubbing or general discomfort etc the quicker they are likely to receive a new replacement prosthetic. (Chi – square = 30.943, significance = 0.00) at 100% confidence of a relationship, this was confirmed by (Kendall tau-b= 0.27, Spearman’s rho = 0.30) two non parametric tests which indicated a weak association.
(y) Sub-proposition 2d- Patients that wear stump socks have limited knowledge of the choices available to them.

These results seem to suggest that there is a relationship between the patient wearing stump socks and patients limited knowledge of alternatives available to them (Chi – square = 34.044, significance = 0.00), or 100% confidence of a relationship. This was confirmed by subjection to the non parametric tests, (Kendall tau-b = 0.26, Spearman’s r = 0.28) which indicated that the strength of the association was weak. This variable suggests that if the limb fitting center had provided information on stump sock alternatives patients would be interested and likely to enquire about them.

(z) Sub-proposition 2e- The number of stump socks worn by the patient is a good indicator of the level of communication between the patient and the limb fitter as greater the rapport the better the prosthesis is likely to fit and therefore the lower the number of socks necessary.

These results seem to suggest that there is a relationship between the number of stump socks worn by the patient and them asking questions of the limb fitter (Chi – square = 29.913, significance = 0.00) or 100% confidence of a relationship. It is suggested that this may be the case due to the suggestion that increased patient/limb fitter communication results in the prosthetic being of greater comfort and of better fit. This was confirmed by subjection to the non
parametric tests (Kendall tau-b = 0.26, Spearman’s roe = 0.28) which however indicated that the strength of the association was weak.

(2a) Sub-proposition 2f- The shorter the time the patient takes to put on their prostheses the better fitting the prostheses is likely to be, therefore the higher the level of communication and consultation between the limb fitter and the patient.

This suggests that patients who ask questions of the limb fitter take longer to put on their prostheses. This may infer that the better the communication level between patient and prosthetist the better the fit and comfort of the prosthetic, thus reducing the number of socks worn and the time that it takes the patient to don their limb. (Chi – square = 42.089, significance = 0.00) at 100% confidence of a relationship, this was confirmed by (Kendall tau-b= 0.18, Spearman’s roe = 0.21) two non parametric tests which indicated a weak association.

(2b) Sub-proposition 2g- This proposition states that if the prostheses affects the stump the less satisfied the patient is likely to be with their prostheses and therefore there is likely to have been a breakdown in communications between the prosthetist and the patient during fitting.

This questioning was conducted so as to establish if there was a link between the level of communication between the limb fitter and the patient with regards to any effect on the stump that the prostheses may have.
The question suggested potential levels of patient limb fitter interaction with regards to any negative commentary on the prostheses. It also suggested issues that may arise should the prostheses not be fulfilling the expected level of comfort and therefore satisfaction required by the patient. The results seemed to confirm thesis relationships with a significant crosstabulation (Chi-square = 28.966, significance .000) reinforced by the results of the nonparametric tests conducted (Kendall tau-b = 0.42) and (Spearman’s rho = 0.44) which indicated a moderate correlation between the two variables.

(2c) Sub-proposition 2h- This proposition states that if the fit of the prostheses is uncomfortable the less satisfied the patient is likely to be with their prostheses and therefore there is likely to have been a breakdown in communications between the prosthetist and the patient during fitting.

Patients at both locations, Leicester and Luton Hospital limb fitting centres were queried as to their satisfaction with their prosthesis’s level of comfort and whether they had established their desired prostheses comfort as a result of the level of communication between themselves and the limb fitter.

This was questioned, as there seemed to be a relationship between the number of patients who actively questioned their limb fitter and their response, “yes my prostheses is comfortable.” These variables following crosstabulation substantiated this conjecture (Chi-square = 25.546, significance .000)
reinforced through the non parametric tests (Kendall tau-b = 0.30) and (Spearman’s rho = 0.32) which indicated a weak correlation.

(2d) Sub-proposition 2i- This proposition states that if the prostheses hampers the patient’s movement the less satisfied the patient is likely to be with their prostheses and therefore there is likely to have been a breakdown in communications between the prosthetist and the patient during fitting.

Again similarly to the previous variables crosstabulated, patients at both locations, Leicester and Luton hospitals limb fitting centres were queried as to whether their prostheses hampered their movement in any way. The questioning was aimed at establishing the patient’s level of satisfaction desired from their prostheses and if the practicality of having a prostheses limited their experiences. It was also used as an indicator of communication between themselves and the limb fitter as seemingly good interaction improves the delivered prostheses therefore in theory improving any negative aspect of the prostheses that may hamper patient movement.

This question suggested a relationship which following crosstabulation substantiated this conjecture (Chi – square = 24.000 significance .000) reinforced through the non parametric tests (Kendall tau-b = 0.37) and (Spearman’s rho = 0.39) which again indicated a moderate correlation.
Sub-proposition 2j- This proposition states that if the prostheses hampers the patients movement due to its fit the less satisfied the patient is likely to be with their prostheses and therefore there has potentially been a breakdown in communications between the prosthetist and the patient during fitting.

This data suggest that if the patient questions the limb fitter they are more likely to be fitted with a prosthetic that does not hamper their movement due to its fit. This may suggest that the level of communication between limb fitter and patient increases the likelihood of the patient receiving a well fitted prosthetic which did not limit the patient ability to participate in day to day activities. (Chi – square = 14.246, significance = 0.00) at 100% confidence of a relationship, this was confirmed by (Kendall tau-b= 0.18, Spearman’s rho = 0.19) two non parametric tests which indicated a weak association.

Sub-proposition 2k- This proposition states that if the prostheses hampers the patients movement due to its design the less satisfied the patient is likely to be with their prostheses and therefore there is likely to have been a breakdown in communications between the prosthetist and the patient during fitting.

This variable suggests that there is no relationship between the patient asking questions the limb fitter and the prosthetic hampering their movement due to its design. This may suggest that communication between limb fitter and patient is a more important factor. (Chi – square = 13.558, significance = 0.00), at 100% confidence of a relationship, this was confirmed by (Kendall
tau-b = 0.20, Spearman’s r0 = 0.22) two non-parametric tests which indicated a weak association.

(2g) Sub-proposition 21- This proposition states that if the prostheses hampers the patient’s movement due to the technology used in its construction the less satisfied the patient is likely to be with their prostheses and therefore there is likely to have been a breakdown in communications between the prosthetist and the patient during fitting.

This variable suggests that there is a relationship between the patient asking questions of the limb fitter and the prosthetic hampering their movement due to its technology. This may suggest that the patient’s requirements with respect of the technology is an indication of satisfaction. Furthermore it may suggest that communication between limb fitter and patient is a more important factor. (Chi – square = 15.000, significance = 0.00) at 100% confidence of a relationship, this was confirmed by (Kendall tau-b = 0.16, Spearman’s r0 = 0.18) two non-parametric tests which indicated a weak association.

(2h) Sub-proposition 2m- This proposition states that if the prostheses hampers the patient’s movement due to their own limitations the less satisfied the patient is inclined to be with their prostheses and it is likely that no level of communications between the prosthetist and the patient during fitting will alter this perception.
This variable suggests that there is a relationship between the patient asking questions of the limb fitter and the prosthetic hampering their movement due to their own limitations. This indicating that communication between limb fitter and patient is an important factor, on the grounds that a patients own limitations can be helped, reduced or eradicated providing the prosthetist is facilitated with the correct instruction and communication from the patient. This is confirmed by the (Chi - square = 15.949, significance = 0.00) at 100% confidence of a relationship and the two non parametric tests (Kendall tau-b= 0.12, Spearman’s rho = 0.13) which indicated an association although weak.

(2i) Sub-propoposition 2n- If the patient does not receive their desired prostheses fit then they are likely to be less satisfied with the prostheses and therefore the level of communication between the limb fitter and patient has not been attained.

This data suggest that if the patient questions the limb fitter they are more likely to be fitted with a prosthetic that matches their socket fit requirements, whether close or loose fitting. This may suggest that the level of communication between limb fitter and patient increases the likelihood of the patient receiving a well fitted, comfortable and practical prosthetic according to their own requirements. This was confirmed by (Chi – square = 39.183, significance = 0.00), at 100% confidence of a relationship and (Kendall tau-b= 0.28, Spearman’s rho = 0.31) which association although weak.
Sub-proposition 2o- If the patient does not feel that they walk well in their prostheses they are likely to be less satisfied with the prostheses and therefore the level of communication between the limb fitter and patient has not been attained in order to receive suitable deliverables.

Patients were asked whether they felt they walked well in their prostheses. This was to establish the potential of a relationship between the level of communication between the prosthetist and the patient, suggesting that if the patient felt they walked well they were more likely to communicate with the prosthetist at an advantageous level to achieve this level of satisfaction.

Additionally it can be suggested that the more satisfied the patient with their walking ability the more likely the prosthesis has bee questioned and improvements made through the communication and interaction between both parties.

These two variables once crosstabulated suggested a relationship (Chi – square = 34.676, significance .029) which again was further substantiated by the use of the two non parametric tests (Kendall tau-b = 0.38) and (Spearman’s r = 0.40 ) which indicated this relationship to be of moderate strength.

Sub-proposition 2p- If the patient feel that their walking distance is limited for any reason attributable to the limb fitting process they are likely to be less satisfied with the prostheses and therefore the level of communication between the limb fitter and patient has not been attained.
This data suggest that the patient's questioning of the limb fitter has an impact on negative concomitant or amputee associated issuers that limit the distance they are able to walk. This may suggest that the level education available to the amputee is insufficient or of poor quality, due to the apparent nature of many of the complaints being easily rectified through communication, increased awareness, education and general availability of information resources. This relationship is confirmed by (Chi – square = 45.396, significance = 0.01) at 100% confidence of a relationship, and further substantiated by (Kendall tau-b= 0.16, Spearman's roe = 0.25) two non parametric tests which indicate an association although weak.
<table>
<thead>
<tr>
<th>Variables Crossed (Communication)</th>
<th>Sub-Sub Variable (Tertiary)</th>
<th>Value Chi-Square</th>
<th>Asymp.Sig Chi-Square</th>
<th>Kendall's Tau-b</th>
<th>Spearman's Roe</th>
</tr>
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<tr>
<td>Do you ask questions of your limb fitter?</td>
<td>Do you question your limb fitter</td>
<td>35.357</td>
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<td>0.53</td>
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<td></td>
<td>Are you part of a disabled organization?</td>
<td>27.300</td>
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<td></td>
<td>How good is your knowledge?</td>
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<td>0.18</td>
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<td></td>
<td>Received rehabilitation (Walking Training)</td>
<td>68.333</td>
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<tr>
<td></td>
<td>Received rehabilitation (Life Coaching)</td>
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<td>0.36</td>
<td>0.38</td>
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<tr>
<td></td>
<td>Received rehabilitation (Disablement Counseling)</td>
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<td>0.00</td>
<td>0.48</td>
<td>0.50</td>
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<td></td>
<td>Received rehabilitation (General Disability info)</td>
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<td>0.39</td>
<td>0.41</td>
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<td></td>
<td>Received rehabilitation (Other forms)</td>
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<td>0.00</td>
<td>0.40</td>
<td>0.41</td>
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<td></td>
<td>Have you ever received counseling</td>
<td>47.640</td>
<td>0.00</td>
<td>0.34</td>
<td>0.36</td>
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<td></td>
<td>How well are you included (decisions)</td>
<td>51.350</td>
<td>0.00</td>
<td>0.18</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>How well are you informed (decisions)</td>
<td>51.952</td>
<td>0.00</td>
<td>0.18</td>
<td>0.20</td>
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<tr>
<td></td>
<td>How able are you to describe problems?</td>
<td>57.167</td>
<td>0.00</td>
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<td>0.18</td>
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<td>How well are your descriptions understood?</td>
<td>52.711</td>
<td>0.00</td>
<td>0.20</td>
<td>0.23</td>
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<td>Have you ever been offered info on (your disability)</td>
<td>38.675</td>
<td>0.00</td>
<td>0.26</td>
<td>0.28</td>
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<tr>
<td></td>
<td>Have you ever been offered info on (your prosthetic)</td>
<td>49.942</td>
<td>0.00</td>
<td>0.40</td>
<td>0.42</td>
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<tr>
<td></td>
<td>Have you ever been offered info on (limb fitting process)</td>
<td>48.469</td>
<td>0.00</td>
<td>0.35</td>
<td>0.36</td>
</tr>
<tr>
<td></td>
<td>Have you ever been offered info on (amputee health care)</td>
<td>38.806</td>
<td>0.00</td>
<td>0.28</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>How useful info received on (your disability)</td>
<td>43.934</td>
<td>0.00</td>
<td>0.29</td>
<td>0.31</td>
</tr>
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<td></td>
<td>How useful info received on (your prosthetic)</td>
<td>48.978</td>
<td>0.00</td>
<td>0.26</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>How useful info received on (limb fitting process)</td>
<td>50.063</td>
<td>0.00</td>
<td>0.32</td>
<td>0.35</td>
</tr>
<tr>
<td></td>
<td>How useful info received on (amputee health care)</td>
<td>43.028</td>
<td>0.00</td>
<td>0.28</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td>If never received such info would you consider it useful?</td>
<td>61.887</td>
<td>0.00</td>
<td>0.27</td>
<td>0.29</td>
</tr>
<tr>
<td></td>
<td>Have you ever been offered info on (prosthetic choice)</td>
<td>50.589</td>
<td>0.00</td>
<td>0.42</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>Would you like info on (prosthetic choice)</td>
<td>35.922</td>
<td>0.00</td>
<td>0.42</td>
<td>0.44</td>
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<td></td>
<td>How often do you need new prostheses</td>
<td>30.943</td>
<td>0.00</td>
<td>0.27</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td>Do you wear stump socks</td>
<td>34.044</td>
<td>0.00</td>
<td>0.26</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>Do you wear stump socks (number worn)</td>
<td>29.913</td>
<td>0.00</td>
<td>0.26</td>
<td>0.28</td>
</tr>
<tr>
<td></td>
<td>How long does it take to put on your prostheses</td>
<td>42.089</td>
<td>0.00</td>
<td>0.18</td>
<td>0.21</td>
</tr>
<tr>
<td></td>
<td>Does the socket affect your stump?</td>
<td>28.966</td>
<td>0.00</td>
<td>0.42</td>
<td>0.44</td>
</tr>
<tr>
<td></td>
<td>Is the fit of your prostheses comfortable?</td>
<td>25.546</td>
<td>0.00</td>
<td>0.30</td>
<td>0.32</td>
</tr>
<tr>
<td></td>
<td>Does your limb hamper your movement?</td>
<td>24.000</td>
<td>0.00</td>
<td>0.37</td>
<td>0.39</td>
</tr>
<tr>
<td></td>
<td>Does your limb hamper your movement Due to its fit?</td>
<td>14.246</td>
<td>0.00</td>
<td>0.18</td>
<td>0.19</td>
</tr>
<tr>
<td></td>
<td>Does your limb hamper your movement Due to its design?</td>
<td>13.554</td>
<td>0.00</td>
<td>0.20</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>Does your limb hamper your movement Due to technology?</td>
<td>15.000</td>
<td>0.00</td>
<td>0.16</td>
<td>0.18</td>
</tr>
<tr>
<td></td>
<td>Does your limb hamper your movement Due your own limitations?</td>
<td>15.949</td>
<td>0.00</td>
<td>0.12</td>
<td>0.13</td>
</tr>
<tr>
<td></td>
<td>What sort of prosthetic fit do you prefer?</td>
<td>39.183</td>
<td>0.00</td>
<td>0.28</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>Do you feel you walk well in your prosthetic?</td>
<td>34.676</td>
<td>0.00</td>
<td>0.38</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>Why in your opinion is your walking distance limited?</td>
<td>45.396</td>
<td>0.00</td>
<td>0.16</td>
<td>0.25</td>
</tr>
</tbody>
</table>
8.8 Hypothesis Testing

As stated in chapter 5 the use of the questionnaire highlighted invaluable findings used to investigate issues of interest to the patient/amputee and variables that had not previously become evident from the extensive literature review. Such previously unidentified variables of patient knowledge/communication regarding the limb fitting process, their disability and their prosthetics which had become a visible and dominant variable from the final questionnaire have since been assessed and evaluated.

The variable of communication has become of greater prominence and importance than the other three namely fit, comfort and practicality. As a result this chapter has concentrated on the results of crosstabulations focused on the communication between patient and prosthetist, which impact on the patients level of prosthetic satisfaction and the suitability to the patient of the deliverable prostheses. However due to the results of the parametric tests used on all variables namely those of fit, comfort, practicality and communication, the individual propositions were briefly discussed in terms of propositions.

8.8.1 The Relationship Between the Main Variable of Fit and the Patients Satisfaction with their Prostheses

Proposition 1- Differences in the fit of the prostheses will produce differences in user attitudes, that is the more suitable the prostheses to the individual the higher their level of satisfaction.
Null Proposition 1- Differences in the fit of the prostheses will not produce differences in user attitudes or their level of satisfaction with their prostheses.

Having examined the proposition and its sub-propositions in terms of affecting tertiary variables encompassed within the fit of the prostheses, Null Proposition 1 with respect to the differences in the fit of the prostheses will not produce differences in user attitudes and level of satisfaction, can be rejected in favour of the proposition.

8.8.2 The Relationship Between the Main Variable of Comfort and the Patients Satisfaction with their Prostheses

Proposition 2- Differences in the comfort of the prostheses will produce differences in user attitude, that is the more suitable the prostheses to the individual the higher their level of satisfaction.

Null Proposition 2- Differences in the comfort of the prostheses will not produce differences in user attitudes or their level of satisfaction with their prostheses.

Having examined the proposition and its sub-propositions in terms of affecting tertiary variables encompassed within the comfort of the prostheses, Null Proposition 2 with respect to the Differences in the comfort of the prostheses will not produce
**differences in user attitudes and their level of satisfaction with their prostheses**, can be rejected in favour of the proposition.

8.8.3 **The Relationship Between the Main Variable of Prostheses Practicality and the Patients Satisfaction with their Prostheses**

**Proposition 3-** Differences in the practical use of the prostheses within the lifestyle of the patient will produce differences in user attitude. The more suitable the prostheses to the individuals lifestyle the higher their level of satisfaction.

**Null Proposition 3-** Differences in the practical use of the prostheses within the lifestyle of the patient will not produce differences in user attitudes or their level of satisfaction with their prostheses.

Having examined the proposition and its sub-propositions in terms of affecting tertiary variables encompassed within the comfort of the prostheses. **Null Proposition 3 with respect to the differences in the practical use of the prostheses within the lifestyle of the patient will not produce differences in user attitudes or their level of satisfaction with their prostheses**, can be rejected in favour of the proposition.
8.8.4 The Relationship Between the Main Variable of Patient Prosthetist Communications and the Patients Satisfaction with their Prostheses

Proposition 4- Differences in the level of communication held between the patient and prosthethist at all levels and stages of the limb fitting process will produce differences in user attitude. The more communication between both parties the more suitable the prostheses to the individual the higher their level of satisfaction.

Null Proposition 4- Differences in the level of communication held between the patient and prosthethist at all levels and stages of the limb fitting process will not produce differences in user attitude. The more communication between both parties the more suitable the prostheses to the individual the higher their level of satisfaction.

Having examined the proposition and its sub-propositions in terms of affecting tertiary variables encompassed within the comfort of the prostheses, Null Proposition 4 with respect to the Differences in the level of communication held between the patient and prosthethist at all levels and stages of the limb fitting process will not produce differences in user attitudes, that is the more communication between both parties the more suitable the prostheses to the individual the higher their level of satisfaction, can be rejected in favour of the proposition.
Therefore the null hypothesis can be rejected in favour of the hypothesis.

8.9 Conclusions

This chapter has tested the hypothesis in terms of its propositions and null-propositions, which encompassed the three main variables of fit, comfort, practicality and the newly recognized variable of communication in connection to the patients satisfaction with their prostheses.

This chapter has illustrated that the positive hypotheses, which involve these four variables, can be identified and favoured.

Differences in the fit of the prostheses will produce differences in user attitudes, that is the more suitable the prostheses to the individual the higher their level of satisfaction.

Differences in the comfort of the prostheses will produce differences in user attitudes, that is the more suitable the prostheses to the individual the higher their level of satisfaction.

Differences in the practical use of the prostheses within the lifestyle of the patient will produce differences in user attitudes, that is the more suitable the prostheses to the individuals lifestyle the higher their level of satisfaction. Differences in the level of communication held between the patient and prosthetist, at all levels and stages of the limb fitting process will produce differences in user attitudes, that is the more
communication between both parties the more suitable the prostheses to the individual the higher their level of satisfaction.

In addition this chapter has shown that the four main variables and the patients overall satisfaction with the delivered prostheses are related. This final chapter therefore outlines the general conclusions that can be drawn from this study, its wider implications and mentions areas for further research.
CHAPTER 9

CONCLUSIONS

9.1 Introduction

This chapter aims to describe the conclusions in general that can be drawn from this study and its wider implications, theoretical and practical. General deductions, summaries and conclusions are discussed and related to the primary issues investigated.

Furthermore this chapter outlines the problems and background which together defines the research objectives and proposed conclusions. Drawing from all aspects of the study, issues contributory to the users levels of satisfaction with the overall design and patient requirements of the prosthetic limb and limb fitting process are considered. Finally the chapter concludes with an abridged illustration of the wider implications of this study and areas for future investigation.

9.2 Background and Research Objectives

The primary focus of this study is an investigation of patient prosthetic needs and deliverable levels of prosthetic satisfaction based on research at two NHS limb fitting centres in the United Kingdom, Leicester NHS Trust and Luton and Dunstable NHS Trust.
This was initially conducted via the assessment of patient attitudes and perceptions with respect of three main variable fit, comfort and practicality. With the later investigation of the variable of patient prosthetist communications, which was identified during the preliminary investigations.

The impetus and energy behind this study was prompted by the evidence of general dissatisfaction within the patient ranks and research and development within all aspect of prosthetic, rehabilitation, and disability studies, internalised within the medical profession. The abundance of literature, observation, patient and practitioner viewpoints and supplementary evidence all indicated a core or group of core elements, at which patient dissatisfaction could be targeted.

Although it is generally argued, providing the needs and requirements of the patient are attained within the limitations of the particular patients abilities, the patient will be satisfied with the delivered prostheses, thus facilitating their active participation in all areas of day to day, modern living. However, through the observation and questioning of prostheses wearers, in addition to interviews with members of the medical staff, ranging from prosthetists, nurses, doctors and rehabilitation staff, the reverse was suggested. This revealed that there were very few patients that were totally satisfied with their prostheses, due to the prostheses having a negative effect on their lifestyle. This therefore suggested that there were underlying issues affecting patients levels of satisfaction with their prostheses.

Furthermore the extensive literature review revealed a distinct lack of research regarding the relationship between the deliverable prostheses and the needs and
requirements of the patient and how this affects overall patient satisfaction. In spite of these factors the study identified that there was very little in terms of guidance or standards which are used to assess patients satisfaction levels with the delivered prostheses.

Therefore a comparative study of patient satisfaction with the four main variables was undertaken. The main hypothesis being that there is a relationship between the design, fit, comfort and practicality of the prosthetic limb and patient levels of satisfaction. This was conducted by the examination initially of three key design variables. Being, the patients reported level and suitability of the prosthesis fit, the level of comfort the patient experienced within the prostheses and the attained level of practicality when using the prostheses. Followed by the investigation of the fourth variable, communications level between patient and prosthetist and patient satisfaction.

The investigation used patients attending both locations, Leicester and Luton for subjective measuring of levels of satisfaction established by the assessment of patient perception and attitude towards the four variables.

Additionally a descriptive background was portrayed, illustrating the historical, physical and psychological aspects of the design and development behind the prostheses and the forces driving development. This was undertaken so as to identify historic issues within the field of prosthetics that may have an impact on the needs and requirements of the amputee patient today and as an illustrative tool.
The objectives of the study can therefore be summarised as follows:

To investigate the methodologies relating to the development and manufacture of artificial limbs both presently and historically. Including issues regarding the physical disability of wearing a prosthesis and the psychological impart and establish issues of importance to the amputee such as comfort, practicality and fit.

To investigate the patients response toward artificial limbs available within the United Kingdoms National Health Service provided by the limb fitting centres at two hospitals those of Leicester and Luton and their deliverable levels of patient satisfaction, denying or confirm the factors present in the literature, interviews and observation.

To suggest improvements to the limb fitting process so as to improve patients requirements and user satisfaction levels.

In order to achieve the objectives of this study a detailed examination of the following areas was made:

- An assessment of the historical definitions behind the concept of disability.
- An investigation into the rights of the disabled person.
- An assessment of the factors which influence and effect the concept within defined social normality.
- The publics reaction to disability both historical and contemporary
- An assessment of the problems associated with the differing levels of amputation.
• An investigation into the reasons behind the development of the artificial limb, through the examination of historical case studies.

• An investigation of the amputation and fitment process proceeding the patients prescription of a new prosthesis.

• An investigation into the contemporary issues of importance to the amputee with regards prosthetic satisfaction and deliverables isolating the variables for investigation. (chapter 4)

• An assessment of the methodological testing of the variables by means of the development of a research tool by which patient prosthetic satisfaction could be assessed. This included an outline of the evaluation model and the activation of the hypothesis with regards to the relationship between design, fit, comfort and practicality and the later identified variable of communication.

• The assessment of the evidence gathered from the pilot studies including findings and data regarding the main variables under investigation.

• A comparative study of the reception and waiting area design in terms of the independent variables, fit, comfort, practicality and communication and their relation to patient satisfaction, thus testing the hypothesis.

• An analysis of the relationship between the variables and patient prosthetic satisfaction are discussed in order to test the hypotheses thus confirming or denying its existence

Following the investigation into these aspects of the study the subsequent conclusions were drawn.
9.3 On the Assessment of the General Background Behind the Concept of Disability

The study identified that there were numerous variations behind the issues of disability produced by differing perceptions, social, cultural and historical influences. The study also revealed that this was the impetus behind the continued development of the prostheses, in an attempt to regain what was lost or attain what was absent, demonstrating the origins of disability.

Historically the study argued that the forces behind the perception of disability within the three identified models, being, the religious, medical and human rights all impacted on the advancement of the field in a myriad of ways.

The religious model may, attribute the occurrence of disability to either, blessing or curse. Thus establishing the disabled position within the community and indeed the family, to be shunned, abandoned and locked away or revered and included as an active member and participant within their limitations.

From this less enlightened, belief based model the study illustrated the awakening of what can be counted as the dawn or science through the emergence of the medical model. Illustrating that although mans knowledge had improved the old habits of segregation and intolerance died hard. Often having similar results, with the definitions being medically categorized rather than created through the pasts religious intolerance. Definitions were defined by their usefulness within society, their cost to society or their burden commonly resulting in their institutionalisation.
From this institutionalised approach the study indicated the human rights based crusade that saw the disabled person fight for their own voice and equal position within society through the use of legislation aimed at the eradication of discrimination. Highlighting that disability is not just a medical categorization but can be largely attributed to the lack of community participation, though, employment, education, recreational and social interaction.

The study also indicated the emergence of a new 21st century medical model for disability through the use of genetic testing which is becoming increasingly apparent within the public eye. The study further indicated that such a definition may result an expeditious explosion of peoples that can be classified as disabled, this time not through mental or physical impairment but through what can be counted as little more than bad genes!

Each of these models indicated the core reasoning behind prostheses development, behind active participation and social acceptance, a desire generally exhibited by both able bodied and disabled alike.

Further indication of this necessity to strive towards the idealized classification of the norm was indicated an argued within the study by means of an explanation of the definition of the term “normal” within the context of the human physical/mental construct. The study suggested that the modern definition as subscribed to by the United States and many other first world economies could be assigned to any one,
whether clinically categorized as disabled or not. Inferring that present definitions, have a greater relation to political correctness than handicap.

Furthermore, due to the apparent abundance of peoples with physical disabilities, however, contrived, there seem to be very few people who are actually “normal”. Arguing that although disability is a fluid condition affecting most of the population in one sense or another the physically disabled still demand to actively compete with what is the accepted norm, dispelling the oppression enforced by their surroundings and societal influence.

The study continues to argue the reasoning behind this apparent need to be equal explaining the issues driving the individuals demands. Illustrating the desire to achieve the preconceived norm directly confronting issues of body image and its effect on the psychological build. Suggesting that identifiable needs must be addressed in order to facilitate the individuals participation in all areas of day to day life, in turn reducing any feelings or perceptions of inadequacy.

Furthermore this study identifies and argues that issues such as gender, age, education, employment and life satisfaction have a great bearing on achievable quality of life, again with equality having being a tour de force within developing the field of prosthetics.
9.4 On the Assessment of the Associated Problems Behind Amputation and the Need For Continued Development of the Prosthetic Limb

This study identified that the use of a prosthesis of adequate quality and suitability is paramount to the rehabilitation of an individual following amputation, isolating issues of energy expenditure and concomitant conditions as being particularly problematic to the rehabilitation process. Highlighting the importance of early postoperative prosthetic fitment, so as to limit the effects of inactivity to muscle, strength and stamina, suggesting that fitment should occur within 135 days following amputation.

Additionally the study indicated and argued the importance of the role of the patient in the attainment of acceptable levels of mobility. Stating that patient perseverance was the key to the satisfactory regain of any reasonable mobility, which in turn affects levels of depression.

It was also argued that patient perseverance with respect of pre and post prosthetic training had an effect on the prosthesis wear duration. However the study argued that there was an advantage to shorter periods of walking training to the favoured prolonged training, suggesting that shorter periods had more effect as a result of the lessened psychological shock of having to learn to walk again.
9.5 On the Assessment of the Associated Needs for Continued Development of
the Prosthetic Limb

The study through historic case studies has illustrated the demand for improved
prosthetics, arguing that the general theme connected with disability is the lack of and
inferiority through the ages resulting in an individual's inability to pursue a full and
active life. Therefore it has been argued that this inability and lack must be corrected
by addressing the core problem, being that the prosthetics are unsuitable and do not
facilitate the users in obtaining their previous or an adequately comparable standard of
mobility/ability with non-disabled persons. With the advancement of technology
failing to satisfy evolving and ever more strenuous demands.

The study further argues that within history and nature it has always been recognized
that in order to function on an equal level as non-disabled persons it is necessary to
achieve an equal mobility and functionality. Arguing that amongst others is the need
to mimic our pears primitively conforming, being little more than an attempt to fit in
within society thus aiding amongst others means of communication and acting as a
defence mechanism.

9.6 On the Explanation of Terms and Description of the Methods Behind
Amputation and Prosthetics

This study has argued and illustrated the decisions behind the science of amputation
in relation to the fitment of the prostheses. Defining and summarising the physical and
emotional obstacles experienced by the amputee during the adjustment period between amputation and the fitment of their first prostheses, arguing that it is following these stages that the patient is truly tested. Indicating that although the surgical period has passed and the trials associated with prosthetic fitting have been completed, it is now that the patients resolve is tested in their attainment of a high quality of life. Feasibly through perseverance achieving an equal par with their non-amputee counterparts with their first awkward steps improving eventually it is hoped to an extent where the patient is undiscernibly recognisable as wearing a prosthesis.

The research argues that the whole process of rehabilitation from initial amputation to the final definitive prostheses is conditional on patients drive and willingness to try and attain an acceptable and feasible level of mobility and activity. Indicating that although technology has evolved dramatically and prosthetist have graduated from tradesman to specialist the amputees role is pivotal in limiting the impact of their situation as a disabled person on their lives.

9.7 On the Assessment of the Issues of Importance to the Amputee with Regards to Prosthetic satisfaction

The research argues the application of measurable factors used to assess patient satisfaction with reference to the evaluation of issues reportedly of importance to the wearers of prosthetics. Although identifying as being a difficult undertaking, the study argued that through the use of other studies in the field, the easy isolation of indictable variables of that could be authenticated.
The study further identified the necessary investigation of issue of satisfaction, outcomes measurement and quality control, identifying their continuous assessment and improvement within the health care service sector. Further identifying that the reasoning behind this perpetual improvement was the drive to improve patient satisfaction with the prosthesis through the investigation of patient needs and requirements and whether or not they were being satisfactorily delivered by the prosthesis.

The study identified and argued the formulation of a model composed from the literature, mainly consisting of seven variables for the indication of patient satisfaction. Further categorising into three main fields comprised of prosthesis fit, comfort, practicality and the their impact on prosthesis design and ultimately their effects on the attitudes and perceptions of the user.

Using these categories the study argued and distinguished a simple measurement model for user satisfaction with their prosthetic and quality of life, through the assessment of the achieved goals delineated by the seven variables. This it was also argued by the study implied additional factors seemed to impact on patient satisfaction with their prostheses.

9.8 On the Research Methodology and Testing of Hypothesis

The study identified and argued that the use of questionnaires as a the primary research tool was paramount in the attainment of information on patient/users satisfaction with their artificial limbs in terms of fit, comfort and practicality. Arguing
that it was necessary for it to be supplemented by interviews from the medical fraternity, and the patient/users themselves.

The study identifies that the process by which the researcher conducted the study facilitated the general data and information gathering within all areas of the study. With the final questionnaire gathering data necessary for the identification of the main factors, affecting the patient/users satisfaction with their prosthetic, both factually and perception based.

The study identified factual data such as patient age, sex, age at loss of limb and so on and perception based information, built up of patients feelings regarding their treatment and prosthetic satisfaction, including satisfaction indicators connected with life style and the prosthetics effectiveness.

The study argued the need for a pilot questionnaire so as to adequately and objectively assesses the appropriateness of the research method. Identifying that through its use the researcher could become familiarised with the questionnaire as a research tool and reveal limitations within the method, such as the effect of potentially ambiguous wording, misleading questioning or misunderstood enquiry.

As a result the study argued and identified the learning curve and extensive modification of thinking prior to the final questionnaire. Which although the pilot questionnaire was primarily intended as a learning exercises and a means of gaining experience in the administration and control of questionnaire data management. It actually highlighting findings, proving the existence and relevance of issues of
interest to the patient/amputee and previously unveiled unexplored and invisible variables that had not become evident from the extensive literature review.

Further more the study argued that the variable of patient knowledge/communication regarding the limb fitting process, their disability and their prosthetics had become a discernible and dominant variable as a consequence of the investigation conducted through the final questionnaire.

9.9 On the Assessment of the Specific Findings.

This chapter empirically identified through the use of sub and tertiary variables the strength of the relationship held between the three main variables under investigation, namely fit, comfort and practicality in reference to patient prosthetic satisfaction and any possible connection they may have with the variable of patient prosthetist communication.

The study investigated and argued subjective measures gaining a deeper understanding of the relationships involved. Including background factors pertaining to the patients, financial security, age, sex, education level and so on.

Through this investigation it was evident that there were a number of relationships that may have an impact on patient prostheses satisfaction levels. This was investigated through the use of statistical analysis via the computer package, SPSS (Statistical Package for the Social Sciences) chosen, for its popularity in use within the social science field and its use within the prosthetics field (Nie, N. et al 1975).
Its features allowed for the investigation via the measurement of frequencies (The number of respondents which fall into a category or variable) and crosstabulations (The number of respondents that fall into a response category when consideration is made between two variables) statistically assessed through the use of Chi-Square as its index of association.

Through the use of such statistical analysis the occurrence of 95% significance between relationships was discovered to very high as a result suggesting a very significant set of relationships between variables. This study further argues and identified that the occurrence of 100% significance between main variables is evident within a significant number of relationships being identified.

Further more the study identified and argued the significance of the fourth main variable of patient prostheses communication which had not become evident until the completion of the questionnaire stages. Identifying a significantly higher number of relationships with 100% confidence than those demonstrated by the other main variables thus suggesting the greater importance of this variable in the attainment of patient prostheses satisfaction.

9.10 On the Assessment of User Response In Relation to the Four Main Propositions

The study identified and argued that in terms of the user attitudes towards their prostheses the ten sub-propositions showed the possibility of the existence of
correlation between the fit of the prostheses and the level of user satisfaction. That is
the higher the associated value the higher the likely level of patient satisfaction,
alternatively many findings suggested that the fit of the prostheses had little impact on
the satisfaction levels of the patient.

In terms of the user attitudes towards the comfort level delivered by their prostheses
the ten sub-propositions indicated the existence of correlation between the patients
overall satisfaction with the prostheses. The higher the correlated value the greater the
level of patient satisfaction. Although, some of these findings suggested a positive
correlation, others were negative which possibly implies that there is no association
and therefore no effect on patient prostheses satisfaction within the sub-variables.

Practicality and its associated variables also indicated generally the same correlation’s
again suggesting that the higher the significance the greater the level of satisfaction.
However, this was also contended by other responses that suggested that there would
be little or no effect on the patients level of prosthetic satisfaction should prosthetic
practicality be addressed.

Dominantly however, the correlation’s via the ten sub-propositions strongly indicated
that there was a relationship between the level of patient prosthetist communications
and their delivered level of prosthetic satisfaction. Suggesting that the greater the
communication between prosthetist and patient the more likely the patient would be at
attaining a satisfactory prosthetic, as categorized according to its fit, comfort and
practicality.
The study has identified and argued that as a result of the greater number of such positive associations connected with patient prosthetist communications, there seems to be an effect on fit, comfort and practicality, with poor communication resulting in a less satisfactory prosthesis.

The study has further identified that although the users attitudes towards the three main variables of fit comfort and practicality were high they were not dominant in the attainment of user satisfaction. In other words not one of the three main variables could be directly attributed to achieving the patients desired level of prosthetic satisfaction. Arguing that the identified variable of patient prosthetist communication was of greater importance, having more impact on levels of satisfaction and in turn impacting greatly on each of the main variables of fit, comfort and practicality.

9.11 On the Specific Findings of the Relationship Between the Objectives and Subjective Measurements Between the Design and the Appropriateness in Use

The study identified and argued the hypothesis held by the three main variables of fit, comfort, practicality and the newly recognized variable of communication, combined with their relationship to the patients satisfaction with each variable and their overall satisfaction with their prostheses.

The study illustrated that the positive hypothesis which involve the four overall main variables could be adopted with respect of the level of patient prostheses satisfaction, rejecting all of the null hypothesis. Therefore the positive hypothesis as follows have been suggested.
(a) Differences in the fit of the prostheses will produce differences in user attitudes, that is the more suitable the prostheses to the individual the higher their level of satisfaction.

(b) Differences in the comfort of the prostheses will produce differences in user attitudes, that is the more suitable the prostheses to the individual the higher their level of satisfaction.

(c) Differences in the practical use of the prostheses within the lifestyle of the patient will produce differences in user attitudes, that is the more suitable the prostheses to the individual's lifestyle the higher their level of satisfaction.

(d) Differences in the level of communication held between the patient and prosthettist at all levels and stages of the limb fitting process will produce differences in user attitudes, that is the more communication between both parties the more suitable the prostheses to the individual the higher their level of satisfaction.

In addition this study has argued and identified that the higher the level of patient prosthettist communication, the higher the likely level of patient satisfaction with each of the other three variables.

9.12 Study Shortfalls

This section outlines some of the areas that may create uncertainty and some weakness within the study.
Although the size and mix of the sample group from each hospital Leicester NHS Trust and the Luton and Dunstable NHS Trust are statistically satisfactory for study within the social sciences, being above 26 candidates from each institution (Polgar and Thomas, 2000). The size and mix of the sample group does have statistical limitations, although satisfactorily within the confines of social science research, these limitations manifest in the following ways.

Each hospital is similarly located in areas which have a high ethnic diversity, as a result it may be suggested that there may be language barriers restricting the patients' ability to satisfactorily answer inquiry. Additionally the age of the respondent could be questioned, with respect to the elderly patient’s ability to read, understand, and complete the questionnaire. Both these issues were anticipated prior to the presentation of the final questionnaire to the limb fitting centres in several ways.

Firstly, the completion of the questionnaire by the patient was undertaken on a purely voluntary and anonymous basis. Secondly, the receptionist of each limb-fitting centre being a non medical member of staff was informed of the questionnaire and where necessary was instructed to assist the patients in its completion should they require. Thirdly the questionnaire was purposely constructed in layman’s terms so that it would be familiar to the patient, therefore eradicating any ambiguous or confusing questioning.

The size of the hospital and limb-fitting centre may also be questioned with respect of sample size limitations. Firstly the choice of limb centre was decided on by the following factors, patient numbers, speciality (lower limb prosthetics or upper limb),
similarity of demographic, similarity of geographical location but particularly comparable size in respect of the number of prosthetists. It was the similarity within these factors that denoted the choice of Leicester Glenfield NHS Trust and the Luton and Dunstable NHS Trust, limb-fitting centres above others centres who expressed an interest in the study.

The validity of the sample group is again confirmed by the similarity held between institutions, preventing bias or an unbalanced assessment of the patient’s satisfaction within each limb-fitting centre. Secondly, the number of patients in attendance could create the possibility of the same person being questioned on more than one occasion. Although this was unlikely due to the duration between patient’s appointments, to prevent this the receptionist at the limb-fitting centre only presented the questionnaire to patients attending on the day, after they had confirmed that they had not completed it previously. Additionally the receptionist made sure that the questionnaire was returned before the patient went home.

It is acknowledged that the study has limitations with respect to the sample size and therefore its validity, as a means of statistically analysing patient satisfaction levels. However, it is argued that the similarity between background factors of each hospital and the verification of statistically acceptable standards as indicated by Polgar and Thomas (2000) are confirmation of validity within the sample size and study findings.
9.13  **Wider Implications**

The wider implications of this study are in general useful not only to the hospitals limb fitting centres in which the study was conducted but have implications for the improvement of overall quality of service and patient satisfaction within all national limb fitting centres. These can be broadly classified in two main areas being, the practical and economic implications.

9.14  **Practical Implications**

The practical implications are concerned primarily with the lessons which can be learned from this study which have a direct impact on designing and fitting a more suitable prosthesis that addresses all the needs as expressed by the patient. As a result is possible to identify the following implications.

The study has indicated that there are standardized guidelines by which patients are prescribed prosthesis according to their level of amputation, age and general fitness levels. However it does appear from the studies findings that there seems to be a shortfall in the level of patient prostheses satisfaction within these guidelines.

It is proposed through the study that this is as a result of the wider implications of the variable of patient prostheses communication. Primarily this is due to the breakdown of descriptive language, common to both parties. Although it appears this has been addressed within the medical fraternity, with the formulation of a universal standardization of descriptive nomenclature agreed on in 1974 by the International
Society of Prosthetics and Orthotics (Working Group, 1974). It appears that there has been no attempt to facilitate and equip the patient with a similar set of terminology to describe features, discrepancies and failures with the prostheses.

Specifically this inadequate level of terminology and breakdown in or lack of patient prostheses communication can impact on the variables of fit comfort and prostheses practicality, the focus of this study, and in turn reducing patient prosthetic satisfaction.

This study therefore indicates and argues the importance of the formulation of a standardized set of descriptions and or terminology, which can be universally spoken between prosthesis and patient thus improving the patients level of satisfaction with the variables under investigation.

This therefore could prove to be an interesting avenue for future research to identify terminology that could be used to describe what are very subjective issues within the general satisfaction of the prostheses. Such research may include educational tools and literature to empower the patient with the necessary descriptive knowledge with reference to not only their condition but the limb fitting process in general and on to the differing choices in prosthetics available to the prosthesis and patient alike.
9.15 Economic Implications

The economic or cost implications of this study are wide relating not only to the efficient running of the limb fitting centre but also the patients own economic security monetarily and otherwise.

Firstly the costs in relation to the limb fitting centre.

- The cost of prolonged fitting times.
- The cost of alteration times
- The cost of scrapping unsuitable or unrecoverable prostheses.
- The cost of occupying a highly qualified prosthetist to attend to demands of a difficult prosthetic fitment.
- The cost of extended waiting lists.

In relation to the patients economic status and additional implications.

- The cost of the duration patients spend away from their working or educational environment.
- The cost of the limiting effects of unsatisfactory prosthetics in all areas of life.
- The cost of physical discomfort resultant through the prostheses.

By indicating these issues the study has highlighted that through adequately addressing the issues connected with patient prosthetist communication it is possible to improve aspects of the limb fitting process such as operational policy in addition to patient prosthetic satisfaction.
9.16 Key Study Outcomes

As presented within this chapter the study has indicated many individual and groups of factors established through the investigation of the literature within the field and the final questionnaire. Such factors can be considered as primary outcomes of this research study and advances within the field of prosthetics. Some of the key outcomes will now be briefly defined.

The research identified many factors that are of specific concern to the patient with regards to problems associated with their prostheses. Patients’ indicated there concerns and anguish in connection with the level of energy expenditure that they exerted in wearing their prostheses. Indicating that the high exertion limited the use of the prosthetics and affected their quality of life in terms of their ability to participate in social activities, educational practices and careers.

Similarly patient’s indicated that they were the prone to many problems such as blisters, soreness, excessive perspiration and abrasions, all of which can be associated with ill fitting uncomfortable prosthetics. As a result affecting patient satisfaction due to the practical limitations and negative affect on comfort levels that such ailments can have.

Yet the research indicated that the key to patients successful adjustment and prolonged, meaningful use of a prostheses is their level of persevere and persistence. This suggests that a positive mental attitude to their predicament as a disabled person will facilitate the acquisition of a higher quality of life and increased mobility.
The research also indicated that walking training as a rehabilitation tool can cause psychological damage to the patient, effecting their willingness and ability to persevere during these initial stages with their prostheses. It was found that this may be due to the walking training being taught in sessions that are too long for the patient to physically cope with thus creating a negative psychological barrier as fatigue and discomfort increase. It is therefore suggested that increased monitoring of the patient is required during the walking training sessions, monitoring their discomfort and fatigue levels on a case by case basis. Alternatively it may be suggested that a more patient driven approach may be suitable, especially in cases where the patients desire to be mobile and gain proficiency are high. Although cases such as this are encouraging, it is of course necessary to monitor the patient so that they do not cause themselves harm or create bad walking habits such as dragging their prosthesis or not fully straightening the knee.

Through the identification of patient prosthetist communication as a variable it has been possible to suggest that the higher the level of communication the greater and more likely the level of patient prosthetic satisfaction. Therefore it can be suggested that all the outcomes derived from this study are greatly affected by the manner in which the patient is able to express their concerns and illustrate problems with the fit comfort, and practicality of their prosthetic. The study has identified many shortfalls with the patient and prosthetists ability to communicate issues in a mutually understandable way, recognising the need for a standardization of descriptive terminology.
As a result of the identification of this communicative breakdown it is possible to suggest the patient’s knowledge with regards to their situation as a prosthetics wearer is limited, a suggestion substantiated by the findings of this study. Identifying that there is a need for the patient to be educated about all stages of the limb fitting process from the initial amputation through to the fitment stages and onto the rehabilitation and walking training. This it was identified would be of benefit to the patient in several different ways. These include, an increased ability to relay issues of importance and problems, reduced feelings of inadequacy and inability to participate in decision making and an active ability to positively effect the fit, comfort and practicality of their prosthetic. Benefits that will lead to an improvement in patient satisfaction levels and quality of provided service.

Through increasing the patient’s knowledge base and listening to there opinions it will be possible to assess standards and raise the quality of the delivered prostheses. It is proposed that individual quality assessment may be conducted on patient opinion, through simple scaling and categorization of the seven human needs common to amputees as identified by Fishman (Fishman, 1959). Therefore facilitating the assessment of patients prosthetic requirements, patients ability to achieve goals with their prostheses and their overall prosthetic satisfaction.

9.17 How Will The Outcomes Be Used

It is foreseen that the outcomes of the study will lead to the formulation of tools for the improvement of communicative standards and overall patient prostheses satisfaction. These tools may comprise of the following.
9.17.1 Patient Educational Literature

This will consist of a handbook given to each patient upon initial attendance at the limb fitting center.

- This handbook will contain various types of information including:
  - Differing types amputation.
  - Prosthetics variations and options.
  - The various stages of the limb fitting process and what happens during each.
  - Basic terminology and explanations of the prostheses features.
  - Prosthetics care.
  - Health information.
  - Disability information.
  - Useful contacts including charity, support groups and sources of further information.
  - Motivational stories of other amputees.

This information is intended to facilitate the amputee whether new or experienced with information necessary to achieve a high level of communication with the limb fitter and therefore improve the likely standard of the delivered prosthetic.

Further information may be presented in pamphlet form to the patient upon the occurrence of issues such as dermatological problems or ways of coping with
educational, social or career options. Such information could also be made available in the limb fitting centres waiting rooms.

9.17.2 Limb Center Improvements

Core to these improvements will be a standardization of language and a means of using descriptive terminology that will be fully understood by all parties from the patient to the prosthetist. This universal non-threatening terminology will also be part of the patient handbook.

The use of this universally understood terminology as discussed earlier will facilitate the structured assessment of patient prosthetic satisfaction by means of simple through the use of simple scaling and categorization of the seven human needs common to amputees as identified by Fishman (Fishman, 1959). Intended to monitor and improve the quality of delivered prosthetics as perceived by the patient.

9.17.3 Study Beneficiaries

The main aim of this study, through the assessment of patients needs, is to improve the suitability of products produced by the limb fitting centre, thus improving patient prosthetic satisfaction and inherently improving their quality of life.

As a result it is foreseen that there are two main groups that will benefit from the research and findings presented within this thesis. The first of these groups, in a broad sense is the medical fraternity, in particular the prosthetist and limb-fitting center
staff, who demonstrate an immense ability and knowledge of the medical field and the implications to the patient of the prosthesis. Yet have a reduced awareness of the negative effects that the limb fitting process has upon the patient, such as the fear and anxiety it often generates. This lack of awareness is frequently created as a result of the patient, who often feel that it is inappropriate to express concerns and or question fitting decisions, fearing that this may cause the prosthetist offence or interfere with procedure. This is due to many patients feeling that they are in the best possible care and do not possess enough knowledge to criticise or hold an opinion.

Therefore it is likely that the findings and indicators of patient prosthetic satisfaction specifically in relation to the level of communication between patient and prosthetist will create an increased awareness amongst the staff with respect to the sometimes-limited experience and insecurity expressed by the patient. Facilitating the centre’s staff including the prosthetist with a new tool by which to put the patient at ease and improve deliverable standards of patient care, by means of enhanced communication.

The likely increase and improvements in levels of communication between parties will not only improvement quality but will also effect the economic feasibility, expenditure and sustainability of the limb fitting centres services and products. Aiding the quality advancement of delivered prosthesis and enhancing decision making with respect to the suitability of prescribed products.

The second of these two groups, likely to benefit from the findings within this study are the patients themselves. Through the recognition of the shortfall within communication levels between patients and prosthetists and the associated lack of
patient knowledge of their situation it will be possible to empower the patient with the necessary information tools. Positively affecting satisfaction, improving the quality and suitability of their delivered prosthetics.

It is foreseen that patients will through educational material become more capable and confident in instructing the prosthetist of any issues that may arise with their prosthetic. This will reduce the patients anxiety and feelings of helplessness, speeding up and making more exact the process of limb fitting. This will in turn improve all areas of the prosthetic including its fit, comfort and the practicality of having a prostheses. Furthermore, is likely to reduce or even eradicate may of the problems that have been identified within this study such as issues associated with badly fitting prosthetics i.e. soreness, rubbing, and increased levels of energy expenditure.

Additionally the patient’s increased ability to communicate their needs more coherently and have them understood more easily, will reduce the time that the patient is required to spend in the limb fitting centre. This means that the patient will require less time away from work, education or other responsibilities, therefore improving the patient’s quality of life and overall levels of satisfaction.

From the outcomes of this study it is easy the identify that many factors that affect the patient are likely to be improved through increased and more accurate communication between patient and prosthetist. Regrettably due to practical confines only some of these findings have been illustrated within this study.
Areas of Further Research

Due to complexity and a lack of time the study was only able to consider a limited number of variables within a small sample group, resulting in the emergence of several undiscovered facts that were not considered in detail some of which deserve further investigation. Theses include background variables relating to whether the patients activities, activity levels and if they had other disabled friends of relations, had an impact on their personal satisfaction with their prosthetic and or disability.

Additionally external factors relating to not only the satisfaction levels of patient users with their prosthesis but also their satisfaction in relation to the limb fitting service as a whole were considered and explored. These included:

- The degree to which the disabled person has adjusted to their handicap.
  How well the prosthesis wearer interacts with their peers both on a physical and psychological plane, including potential indicators towards feelings of inadequacy or limited ability. This derivation was also considered in respect of the causation of the disability in three ways, varying accordingly. Whether the disability was as a result of congenital deformity, accident, or through illness or disease which often have concomitant complications.

- The patient’s activity levels while wearing the prosthetic.
  Referring to the social, educational and recreational activities undertaken while wearing the prosthesis, including their success and accessibility to such activities.
• Understanding of their disability, causation and rehabilitation process, from the potential of surgery through to limb fitting and on to walking training. As a consequence of what is an unforeseen eventuality in any ones life, it is often found within the literature that the patient user is ill-equipped in terms of knowledge and information regarding the stages that they are likely to experience during their rehabilitation.

• Their psychological wellbeing, including outlook on life, level of optimism, confidence and enthusiasm. The literature suggests that the psychological outlook held by the patient has a bearing on the outcomes following and during rehabilitation, positive thinking promoting increased levels of rehabilitation success.

• The number of times that the hospital had been visited in total, irrespective of disability causation. Which from the literature suggested that the more frequent or extended duration’s in hospital reduced patient satisfaction with both the level of service and their prosthesis

• The type of treatment received whether invasive or rehabilitative. Suggesting that the causation of the disability impacted on the users satisfaction as a result of more intrusive procedures leading to feelings of negativity. For example patients that had a normal life and body image until
the amputation were expected to have increased issues of leading to greater
dissatisfaction.

- Their socio-economic background and stability.
  Relating to the fact that many disabled people have lower economic stability
  as a result of their disability than those without a disability.

- Their knowledge with reference to the descriptive terminology behind the limb
  fitting process. (i) Referring to the formulation of standardized descriptions and
  terminology, identification and adoption of a universally spoken nomenclature
  between prosthetist and patient so as to improve the level of patients satisfaction
  with the fit, comfort and practicality attributed to their prostheses and other
  associated variables. (ii) Referring to the formulation of patient prosthetist
  educational tools. The identification of issues of importance that could be used to
  improve the patients knowledge of their own condition, the limb fitting process
  and the terminology behind describing subjective issues again to improve general
  levels of patient satisfaction with their prostheses.

The reasons behind the consideration of the above variables are many but foremost is
their separate and combined potential impact on overall patient prosthetic satisfaction.
Numerous studies have suggested such background issues relating to patient
prosthetic satisfaction which can potentially invade various areas of the patients life to
differing degrees from rehabilitation, to career progression and even social or
relationship building. It is hoped that the identification of these additional influences
on patient prostheses satisfaction may facilitate the creation of a more holistic
approach to the science of prostheses development. Increasingly focused on the actual needs of the patient recognising that development starts and ends with the assessment of patient needs.
APPENDIX A

THALIDOMIDE

An Investigation of the History Behind the Drug
THALIDOMIDE.

The need for chemical and medical advancement has inadvertently resulted in the occurrence of unforeseen and often unprecedented levels of congenital limb deficiency and other disabilities. Most notably being the case of Thalidomide. Known by many names in over 46 countries, this chemical was hailed as a wonder drug (Warren, R. 1999). Developed by the Gruuenthal Chemical Company of Stulberg, West Germany, Thalidomide was initially introduced as a sedative in 1957 (Marquardt E, Fisk J. R 1992), providing a safe and sound sleep, but following its introduction it was found that pregnant women could benefit from the drug as it suppressed the symptoms of morning sickness.

However it was not realised that this seemingly innocuous drug with wondrous properties had an undesirable ability with its molecules being able to cross the placental wall and therefore affect the foetus, additionally presenting a large percentage of the population with peripheral neuritis, a devastating and sometimes irreversible side effect. This regrettably this was not realized until it was too late.

The ingestion of the product during pregnancy, especially in a particular window of time in the first trimester caused startling birth malformations and new-born death. Any part of the foetus underdevelopment during the ingestion could be affected.

"Thalidomide is a teratogen, teratogenesis being the name given to the formation of gross structural abnormalities during foetal development. Teratogenic factors, other examples being rubella (German measles) and
X-rays, act during the part of gestation known as organogenesis, which lasts from the 17th to the 60th day of pregnancy. During this period the embryo undergoes structural organisation and its skeleton and organs are formed.

The type of deformities caused by thalidomide depended upon the exact timing and duration of its administration. Between days 21 and 22 of gestation, thalidomide caused malformation of the ears and cranial nerve defects; from day 24 to day 27, phocomelia of the arms; from day 28 to 29, phocomelia of the arms and legs; and from day 30 to 36, malformation of the hands and anorectal stenosis (narrowing of the lower intestine).”

(Claire Elizabeth Lewis, M.A., D.Phil 1993-1998.)

For babies that survived other birth defects included, deafness, blindness, disfigurement, cleft paller and many other internal disabilities and the most commonly associated side affect phocomelia (Warren R. 1999).

The true number of babies affected by the drug thalidomide will never accurately be known, but it has been claimed that there were between ten and twenty thousand babies born disabled as a consequence of Thalidomide.
Today around the world there are approximately 5000 survivors alive, but never counted and never known are the numbers of miscarried and still born, yet alone are the sheer numbers of family members and parents who have suffered over the years.

It is important to realise that Thalidomide and its identified side affects to date is an isolated case, but it is important that we continue to be vigilant when introducing and using new medications with limited track records.

As previously illustrated Thalidomide was introduced in vast quantities to many countries world wide, with seemingly little monitoring of its effects on the populous following initial treatment of primary illnesses or symptoms.

Following its introduction in October 1957 as a sedative it took a further 4 years for a measure of increased malformations to be realised and reported on by H. R. Wiedemann of Germany in 1961. However no causation could be established.

Later that same year through pure coincidence an attorney in Mendue, West Germany found that his wife had given birth to a child with very similar malformations to that of another woman in the same town. He consulted Dr. Lenz an eminent physician who was later to become the Professor of human genetics at Muenster.

Dr. Lenz quickly identified Thalidomide as a causative agent with a heightened probability of foetal malformation if taken between the 34th and 50th day after a previous menstrual period (Marquardt E. Fisk J.R. 1992). Upon these findings he approached Thalidomide’s developers the Gruenthal Chemical Company on the 15th of November 1961 and expressed his suspicions. Twelve days after this was brought
to the Gruenthal Chemical Company's attention they withdrew the product from the German market, with other countries quickly following.

Although the Gruenthal Chemical Company took rapid and decisive action in an attempt to reduce the continued birth of malformed infants, Thalidomide babies were still being born up until August 1962. In the nine months following Dr. Lenz warning an apparent decrease in frequency of characteristic Thalidomide anomalies was identified.

The withdrawal of this drug saw an understandably high level of public interest primarily generated by the public press rather than medical documentation. As a result, West Germany and other similarly affected countries saw the establishment of paediatric clinics and governmentally supported organisations of parental self help groups, facilitating the exchange of ideas and experiences, domestically and internationally.

The nature of such extreme physical malformations challenged the medical establishment of the sixties world wide. With occupational therapists having to reassess and modify their training. It was quickly found that the Thalidomide child was best aided to adapt to their surroundings in the best way that suited themselves, either with the use of prosthetics or with encouragement to use what they already had. As in most Thalidomide cases the feet were fully or to a larger extent well formed, as a result the medical establishment realised that the feet must be uncovered so as to promote their adaptation for manual function.
The increased numbers of physical disabilities brought about the development of new prosthetics such as pneumatic externally powered prosthetics engineered by Otto Bach in West Germany. The Thalidomide person was encouraged to use what worked for them, with many preferring to only use their prosthetics in public and return to the independence of their feet in private. The congenital absence of arms forced this approach with the occupational therapist helping parents and children alike to adopt their feet as replacement hands.

Adaptations were designed to assist the everyday life of the person, from clothing designed to help with freedom of movement to computers that could empower the disabled person with the operation of a vehicle whatever the severity of their disability. All of which presented the disabled person with opportunities and fulfilment in a social sense.

The combined skills and knowledge of surgeons, occupational therapists, orthopaedic specialists and psychologists were all utilised to help develop a new science to address the issues affecting the child, adult and family affected by Thalidomide. In turn helping other disabled people achieve their potential.

However in 1970 the Thalidomide story took a new and final twist. On December the 18th a significant law suite was settled between the Gruenthal Chemical Company and the West German government. Which saw each making available one hundred million Deutsche Marks to establish a foundation Hilfswerk für behindeste Kinds (Help for the disabled child), used to act as relief for the victims of Thalidomide.
Action such as this was taken out in each of the affected countries with compensation being paid to the victims from the companies concerned. Each case standing as an invaluable opportunity to gather data about Thalidomide. Information thus far has depicted a view of ability over disability with the most Thalidomide victims entering into professional fields and university a considerably higher percentage than the controls, represented in all studies as people unaffected by Thalidomide. This is spite the fact that an overwhelming majority of Thalidomide victims are classified as 100% disabled.

Further indicators of quality of life can be seen with the importance of personal social development, such as getting married, having children and even hobbies which all enrich life experience, all of which and more seem to be within the reach of the Thalidomide victim. Regrettably, however, in addition to the primary disability secondary degenerative effects are becoming prevalent such as joint weakness and arthritic issues, which are intern impacting on quality of life. But more positively, previously expressed concerns regarding issues of hereditary disorders created by Thalidomide seem to be allayed as no victim of Thalidomide who has subsequently become a parent has had a malformed child.

The introduction of Thalidomide though regrettably resulted in unimaginable hardship for its victims and families has however brought about invaluable lessons not only in the way that medical testing has become more stringent but in the way in which society reacts towards disability in general. Thalidomide brought physical disability to the front of peoples minds, reminding them that it could happen to any one, so breaking down barriers of social restriction and ignorance. In addition the pressures
placed upon the medical community to combat such disabilities hastened the advancement of new prosthetic and orthopaedic technologies, almost as much as the pressures created by the I and II world wars.

Again the Thalidomide disaster demonstrates that the primary impetus behind advancement within any field connected with disability is misfortune. Should the need not have arisen to address the issues connected with such catastrophic physical disabilities, there would have been no need for an advancement of thinking and technical development.
References.


APPENDIX B

The Final Questionnaire
PATIENT OPINION QUESTIONNAIRE

Are you □ Male □ Female □ Age

How old were you when you lost your limb?:

Which of the following best describes your disability:

□ Left Arm Below Elbow □ Left Arm Above Elbow
□ Right Arm Below Elbow □ Right Arm Above Elbow
□ Left Leg Below Knee □ Left Leg Above Knee
□ Right Leg Below Knee □ Right Leg Above Knee

Other

What was the reason for your limb loss?

□ Since Birth □ Illness □ Accident □ Other

If through illness which?

If since birth what is the diagnosis?

Since becoming disabled how has it affected your life? And in what way?

Has your disability ever limited you chances in the following? Explain?

□ Education?
□ Workplace?
□ Socially?
□ Sport?
□ Other?

What is your Occupation before becoming disabled and since?

Before □ Since □

Director □ Manager □
Self Employed □ Skilled Worker/Trade □
Manual Worker □ Office Worker □
Shop Worker □ Public Sector □
Professional □ Armed Forces □
Student □ Housewife/Homemaker □
Retired □ Unemployed □

What is your approximate income each year before becoming disabled and since?

Before □ Since □

Under £5,000 □ £25,000-£29,999 □
£5,000-£9,999 □ £30,000-£39,999 □
£10,000-£14,999 □ £40,000-£49,999 □
£15,000-£19,999 □ £50,000-£59,999 □
£20,000-24,999 □ Over £60,000 □

Are you educated to any of the following?

□ Grammar School □ GCSE/Olevels/GCE
□ A Levels □ HND/HNC
□ DEGREE □ MASTERS
□ PhD □ Other (Please Specify)

Do you have any disabled friends or acquaintances? □ YES □ NO

If YES What is their disability?
Are you part of a disabled group or organization?  □ YES □ NO
If so Which?

In terms of your own disability do you feel your knowledge to be
□ Poor □ Good □ Very Good □ Excellent

Do you receive any consultation during your visits to the limb center?

Have you received any of the following form of rehabilitation?
□ Walking Training □ Disablement Counseling
□ Life Coaching □ General Disability Information

Do you ask your limb fitter questions about the fitting during your visit? Why?

Have you ever received any counseling about your disability? Why?

How well do you feel you have been included in making decisions concerning your prosthetic?
□ Not at All □ Poorly □ Satisfactorily □ Very Well □ Excellently

How well do you feel that you are informed about the decisions concerning your prosthetics?
□ Not at All □ Poorly □ Satisfactorily □ Very Well □ Excellently

How able do you feel you are in describing the problems with your prosthetic to the Limb fitter?
□ Not at All □ Poorly □ Satisfactorily □ Very Well □ Excellently

How well do you feel your descriptions are understood and alterations made?
□ Not at All □ Poorly □ Satisfactorily □ Very Well □ Excellently

Have you ever been offered any information on the following?
□ Your Disability □ Your Prosthetic □ The Fitting Process □ Amputee Health Care

In your opinion how useful was the information?
Your Disability □ Poor □ Good □ Very Good □ Excellent
Your Prosthetic □ Poor □ Good □ Very Good □ Excellent
The Fitting Process □ Poor □ Good □ Very Good □ Excellent
Amputee Health Care □ Poor □ Good □ Very Good □ Excellent

If you have never received such information would you consider it useful? And WHY?

Have you ever been offered any information concerning the choice of prosthetics available to you?
□ YES □ NO
If Yes what type of information was it?

Would you like more information concerning prosthetic choice?  □ YES □ NO and WHY?

In your opinion what type of information would you like to receive about your disability and your prosthetics?
## SECTION 2

How often do you need a new artificial limb? (ONE ONLY)
- [ ] Once A Year
- [ ] Every 2 Years
- [ ] Every 5 Years
- [ ] Every 10 Years
- [ ] Other

If known what Type, Make, and Model is it?

<table>
<thead>
<tr>
<th>How long does it take to fit you with a new artificial limb?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Weeks</td>
</tr>
<tr>
<td>-----------------</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

Do you wear Stump Socks [ ] Bare Skin [ ] Other [ ]

<table>
<thead>
<tr>
<th>Number of socks if worn?</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

How long does it take you to put on your limb? (MINS) (ONE ONLY)
- [ ] 1 min
- [ ] 3 min
- [ ] 5 min
- [ ] 10 min
- [ ] 15 min
- [ ] 20 min
- [ ] Other

If Longer than 5 Mins Why?

What material is your socket made from?

Does it effect your stump? If so how?

Is the fit of your limb comfortable?

Does your artificial limb hamper your movement in any way?
- [ ] Do to fit
- [ ] Designer
- [ ] Technology
- [ ] Own Limitations
- [ ] Other

Do you question and criticise your limb fitter as to the fit of your artificial limb?

Would you be interested in a better alternative to stump socks?

Would it be easier not to have stump socks?

By what means is your limb held on?
- [ ] Strap
- [ ] Suction
- [ ] Other

Within the socket do you like?
- [ ] Movement
- [ ] Close Fit
- [ ] Other

Do you feel you walk well in your artificial limb/s?  
- [ ] YES
- [ ] IF NO \_ WHY?

Type of amputation
- [ ] PTO

415
Would you rather a simpler method of attaching your artificial limb?

Do you need help putting on your artificial limbs?

How often do you wear your artificial limbs?

- Ever day
- Every other
- Weekly

How long do you wear them for?

- 5-10 mins
- 11-20 mins
- 21-40 mins
- 41-59 mins
- All Day

How often do you take off your artificial limbs in a single day?

If you wear socks do you use clean socks every time you put your legs on?

Which of the following do you think to be the most problematic?

- Washing
- Hygiene
- Reaction
- Other
- Fit (size)
- Putting on (time/difficulty)

How long are you able to walk in a normal day?

- Not at all
- 5-10 mins
- 11-30 mins
- 31-1 hour
- 2-4 hours
- 5-8 hours
- 9-13 hours
- All Day

Why in your opinion is your walking distance limited?

Do you participate in any of the following?

- Team sports
- Socializing
- Walking/hiking
- Driving
- Gardening
- Dancing
- Cinema
- Fishing
- Shopping
- Swimming

By what means do the limb fitters take casts of your limbs?

Do you feel that you could walk better if more money was spent on the limbs?

Do you have any problems with the fitting of your artificial limbs?

Are you a PRIVATE or NATIONAL HEALTH patient?

THANK YOU FOR YOUR TIME
APPENDIX C

DIAGRAM

Conceptual Model of Research Methodology
Conceptual Model of Research Methodology

**STEP I**
- Formulation of Research Question, Aims, Basic Hypothesis and Variables for Evaluation

**STEP II**
- Conceptualising of Research Design Via Questionnaire Method

**STEP III**
- Pilot Questionnaire Evaluation and Assessment of Variables (Fit Comfort & Practicality)

**STEP IV**
- Final Questionnaire Assessment of Fit Comfort, Practicality and Communication

**STEP V**
- Analysis of Data from Final Questionnaire Via Statistical Analysis

**STEP VI**
- Interpretation of Data and Presentation of Findings Through Thesis

- Communication Identified as having a Greater Impact on Patient Satisfaction Than Fit, Comfort and Practicality

- Processing and Analysis of Statistical Data Through SPSS (Statistical Program for the Social Sciences)

**Key Points**
- Conceptualising of Research Design Via Questionnaire Method
- Assessment of Methodological Research Technique
- Reevaluation of Variables & Addition of Fourth Variable, Construction of Final Questionnaire
- Analysis of Data from Final Questionnaire Via Statistical Analysis
- Interpretation of Data and Presentation of Findings Through Thesis

**Supporting Activities**
- Literature Review, Interviews and Observation
- Construction of Data Collection Method
APPENDIX D

LETTERS

Study Permission Letters From Each Hospital Involved.

Leicester General NHS Hospital Trust.

&

Luton & Dunstable HNS Hospital Trust.
Leicestershire, Northamptonshire and Rutland Health Authority

From the office of Melanie Sursham
Secretary to the Authority
Direct Dial 0116 258 8610

Gwendolen Road
Leicester
LE5 4QF

Tel: 0116 273 1173
Fax: 0116 258 8577
Mini Com: 0116 258 8640
DX 709470 Leicester 12

31 May 2002

Please quote our ref no 6689
Mr R Gravelle
PhD Student
29 Durban Road
Thurcaston Park
Leicester LE4 2LZ

Dear Mr Gravelle

A study of the patient's involvement and satisfaction with the fitment process as the user of an artificial limb - our ref no 6689

I have received a copy of the amended questionnaire and noted that children will not be recruited to this study.

On behalf of the Leicestershire Research Ethics Committee and by Chairman's action I confirm approval for the above research to proceed.

Yours sincerely

M Sursham

P G Rabey
Chairman
Leicestershire Research Ethics Committee
(signed under delegated authority)

(NB All Communications relating to Leicestershire Research Ethics Committee must be sent to the Committee Secretariat at Leicestershire, Northamptonshire & Rutland Health Authority. If however, your original application was submitted through a Trust Research & Development Office, then any response or further correspondence must be submitted in the same way)
From: LOCAL RESEARCH ETHICS COMMITTEE  
South Bedfordshire

To: Robert D. Gravelle, 29 Durban Road, Benskin Croft, Thurcaston Park,  
Leicester, LE4 2LZ

Copy to:

Date of Approval: 15.08.02

Members of the LREC:  
Mr. R. Driver, Chairman, Dr. C. Travill Vice Chairman, Mrs M. Turton (Community Health Council): Dr J Dove (Consultant Histopathologist): Dr. M. Spira (General Practitioner): J. Ang (Community Health Care Trust): Mr. D. Fairclough (Lay Member): Dr. W. Matta (General Practitioner): Dr. S. Stein (Consultant Child Psychiatrist): B. Thatcher (Pharmacist): Mr. S. Burrell (Consultant Obstetrician and Gynaecologist): Mrs S. Feben (Diabetes Specialist Nurse)

The South Bedfordshire Local Research Ethics Committee conforms to the ICH Guidelines on Good Clinical Practice.

Title of study: A study of patients involvement and satisfaction with the fitment process:

SBLREC Ref: Jun02/4a  
please quote this reference on all correspondence

| Study considered for first time by the Committee |
| Study reviewed by the Committee |
| Study examined by Chairman (preliminary) |
| Chairman's action, following examination by the full committee, and subsequent modifications |
| Chairman's action only; examination by committee not necessary |

OUTCOME: Study APPROVED |

XX
DOCUMENTS CONSIDERED:

Protocol No/Date:
Patient Information:
Consent Form:
Questionnaire:

ONE OF THE CONDITIONS OF THIS APPROVAL IS THAT YOU SUBMIT TO
THE COMMITTEE ANNUAL REPORTS ON THE PROGRESS OF THE STUDY.
A REMINDER LETTER WILL BE SENT TO YOU A MONTH BEFORE THE FIRST
REPORT IS DUE.

FAILURE TO PROVIDE REPORTS MAY RESULT IN APPROVAL BEING
WITHDRAWN

Signed (Chairman/Vice-Chairman)

Date 13/9/02

Correspondence to:
Mrs D. Chapman
L.R.E.C. Administrator
Research & Development Directorate
Gnd.floor, Nurses Home
Luton & Dunstable Hospital NHS Trust
Lewsey Road
Luton
LU4 OJZ
Tel: 01582 497421
Fax: 01582 564543
E-Mail: Debbie.Chapman@ldh-tr.anglox.nhs.uk
APPENDIX E

TABLES

Table 1  Variables Affecting Prosthetic Fit
Table 2  Variables Affecting Prosthetic Comfort
Table 3  Variables Affecting Prosthetic Practicality
Table 4  Variables Affecting Prosthetic Communication
<table>
<thead>
<tr>
<th>Variables Crossed (Fit)</th>
<th>Sub-Sub Variable (Tertiary)</th>
<th>Value Chi-Square</th>
<th>Asymp.Sig Chi-Square</th>
<th>Kendall’s Tau-b</th>
<th>Spearman’s Roe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patient Sex</td>
<td>Age at time of limb loss</td>
<td>26.667</td>
<td>0.00</td>
<td>-.02</td>
<td>-.06</td>
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<tr>
<td>Patient Age</td>
<td>Age at time of limb loss</td>
<td>163.714</td>
<td>0.00</td>
<td>0.71</td>
<td>0.81</td>
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<tr>
<td></td>
<td>Reason for limb loss</td>
<td>98.253</td>
<td>0.00</td>
<td>0.08</td>
<td>0.10</td>
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<tr>
<td>Occupation Before</td>
<td>Fitting duration (appointments)</td>
<td>103.657</td>
<td>0.00</td>
<td>0.13</td>
<td>0.17</td>
</tr>
<tr>
<td></td>
<td>Time able to walk</td>
<td>125.248</td>
<td>0.00</td>
<td>-.09</td>
<td>-.013</td>
</tr>
<tr>
<td>Variables Crossed (Comfort)</td>
<td>Sub-Sub Variable (Tertiary)</td>
<td>Value</td>
<td>Asymp.Sig Chi-Square</td>
<td>Kendall's Tau-b</td>
<td>Spearman's Roe</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------</td>
<td>-------</td>
<td>----------------------</td>
<td>----------------</td>
<td>----------------</td>
</tr>
<tr>
<td>Which limb did you lose (Level of Amputation)</td>
<td>Reason for limb loss</td>
<td>32.608</td>
<td>0.00</td>
<td>-.18</td>
<td>-.20</td>
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<tr>
<td>Income Since Disability</td>
<td>Fitting duration (weeks)</td>
<td>105.862</td>
<td>0.00</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td></td>
<td>No stump socks easier</td>
<td>94.885</td>
<td>0.00</td>
<td>-.16</td>
<td>-.19</td>
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<tr>
<td>Occupation Before</td>
<td>Time able to walk</td>
<td>125.248</td>
<td>0.00</td>
<td>-.09</td>
<td>-.13</td>
</tr>
</tbody>
</table>
Table 3: Practicality

<table>
<thead>
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<th>Variables Crossed (Practicality)</th>
<th>Sub-Sub Variable (Tertiary)</th>
<th>Value Chi-Square</th>
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<th>Kendall's Tau-b</th>
<th>Spearman's Roe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Limb Fitting Centre In Attendance (Location)</td>
<td>Limit chances (sport)</td>
<td>16.596</td>
<td>0.00</td>
<td>-.50</td>
<td>-.52</td>
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<tr>
<td>Occupation Since</td>
<td>Why take of limb</td>
<td>115.400</td>
<td>0.00</td>
<td>0.36</td>
<td>0.38</td>
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</table>
Table 4: Communication

<table>
<thead>
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<th>Variables Crossed (Communication)</th>
<th>Sub-Sub Variable (Tertiary)</th>
<th>Value Chi-Square</th>
<th>Asymp. Sig. Chi-Square</th>
<th>Kendall’s Tau-b</th>
<th>Spearman’s Roe</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do you ask questions of your limb fitter?</td>
<td>Do you question your limb fitter</td>
<td>35.357</td>
<td>0.00</td>
<td>0.53</td>
<td>0.55</td>
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<tr>
<td></td>
<td>Are you part of a disabled organization?</td>
<td>27.300</td>
<td>0.00</td>
<td>0.36</td>
<td>0.38</td>
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<tr>
<td></td>
<td>How good is your knowledge?</td>
<td>48.513</td>
<td>0.00</td>
<td>0.15</td>
<td>0.18</td>
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<tr>
<td></td>
<td>Received rehabilitation (Walking Training)</td>
<td>68.333</td>
<td>0.00</td>
<td>0.57</td>
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<td>Received rehabilitation (Life Coaching)</td>
<td>60.008</td>
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<td>Received rehabilitation (Disability Counseling)</td>
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<td>0.48</td>
<td>0.50</td>
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<td>Received rehabilitation (General Disability info)</td>
<td>60.606</td>
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<td>Received rehabilitation (Other forms)</td>
<td>63.000</td>
<td>0.00</td>
<td>0.40</td>
<td>0.41</td>
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<tr>
<td></td>
<td>Have you ever received counseling</td>
<td>47.640</td>
<td>0.00</td>
<td>0.34</td>
<td>0.36</td>
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<tr>
<td></td>
<td>How well are you included (decisions)</td>
<td>51.350</td>
<td>0.00</td>
<td>0.18</td>
<td>0.21</td>
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<tr>
<td></td>
<td>How well are you informed (decisions)</td>
<td>51.952</td>
<td>0.00</td>
<td>0.18</td>
<td>0.20</td>
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<td></td>
<td>How able are you to describe problems?</td>
<td>57.167</td>
<td>0.00</td>
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<td></td>
<td>How well are your descriptions understood?</td>
<td>52.711</td>
<td>0.00</td>
<td>0.20</td>
<td>0.23</td>
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<td>Have you ever been offered info on (your disability)</td>
<td>38.675</td>
<td>0.00</td>
<td>0.26</td>
<td>0.28</td>
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<td></td>
<td>Have you ever been offered info on (your prosthesis)</td>
<td>49.942</td>
<td>0.00</td>
<td>0.40</td>
<td>0.42</td>
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<td>Have you ever been offered info on (limb fitting process)</td>
<td>48.469</td>
<td>0.00</td>
<td>0.35</td>
<td>0.36</td>
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<td>Have you ever been offered info on (amputee health care)</td>
<td>38.806</td>
<td>0.00</td>
<td>0.28</td>
<td>0.29</td>
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<td></td>
<td>How useful info received on (your disability)</td>
<td>43.934</td>
<td>0.00</td>
<td>0.29</td>
<td>0.31</td>
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<tr>
<td></td>
<td>How useful info received on (your prosthesis)</td>
<td>48.978</td>
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<td>0.29</td>
</tr>
<tr>
<td></td>
<td>How useful info received on (limb fitting process)</td>
<td>50.063</td>
<td>0.00</td>
<td>0.32</td>
<td>0.35</td>
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<td></td>
<td>How useful info received on (amputee health care)</td>
<td>43.028</td>
<td>0.00</td>
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<td></td>
<td>If never received such info would you consider it useful?</td>
<td>61.887</td>
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<td></td>
<td>Have you ever been offered info on (prosthetic choice)</td>
<td>50.589</td>
<td>0.00</td>
<td>0.42</td>
<td>0.44</td>
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<td></td>
<td>Would you like info on (prosthetic choice)</td>
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<td>0.00</td>
<td>0.42</td>
<td>0.44</td>
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<td></td>
<td>How often do you need new prostheses</td>
<td>30.943</td>
<td>0.00</td>
<td>0.27</td>
<td>0.30</td>
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<td></td>
<td>Do you wear stump socks</td>
<td>34.044</td>
<td>0.00</td>
<td>0.26</td>
<td>0.28</td>
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<td>Do you wear stump socks (number worn)</td>
<td>29.913</td>
<td>0.00</td>
<td>0.26</td>
<td>0.28</td>
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<td></td>
<td>How long does it take to put on your prostheses</td>
<td>42.089</td>
<td>0.00</td>
<td>0.18</td>
<td>0.21</td>
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<td></td>
<td>Does the socket affect your stump?</td>
<td>28.966</td>
<td>0.00</td>
<td>0.42</td>
<td>0.44</td>
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<td></td>
<td>Is the fit of your prostheses comfortable?</td>
<td>25.546</td>
<td>0.00</td>
<td>0.30</td>
<td>0.32</td>
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<tr>
<td></td>
<td>Does your limb hamper your movement?</td>
<td>24.000</td>
<td>0.00</td>
<td>0.37</td>
<td>0.39</td>
</tr>
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<td></td>
<td>Does your limb hamper your movement Due to its fit?</td>
<td>14.246</td>
<td>0.00</td>
<td>0.18</td>
<td>0.19</td>
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<td>Does your limb hamper your movement Due to its design?</td>
<td>13.554</td>
<td>0.00</td>
<td>0.20</td>
<td>0.22</td>
</tr>
<tr>
<td></td>
<td>Does your limb hamper your movement Due to technology?</td>
<td>15.000</td>
<td>0.00</td>
<td>0.16</td>
<td>0.18</td>
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<tr>
<td></td>
<td>Does your limb hamper your movement Due to your own limitations?</td>
<td>15.949</td>
<td>0.00</td>
<td>0.12</td>
<td>0.13</td>
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<tr>
<td></td>
<td>What sort of prosthetic fit do you prefer?</td>
<td>39.183</td>
<td>0.00</td>
<td>0.28</td>
<td>0.31</td>
</tr>
<tr>
<td></td>
<td>Do you feel you walk well in your prosthesis?</td>
<td>34.676</td>
<td>0.00</td>
<td>0.38</td>
<td>0.40</td>
</tr>
<tr>
<td></td>
<td>Why in your opinion is your walking distance limited?</td>
<td>45.396</td>
<td>0.00</td>
<td>0.16</td>
<td>0.25</td>
</tr>
</tbody>
</table>
APPENDIX F

GLOSSARY

A Brief Explanation of the Some of the Terms Included in the Study
<table>
<thead>
<tr>
<th>Term</th>
<th>Definition</th>
</tr>
</thead>
<tbody>
<tr>
<td>AK</td>
<td>Above the knee</td>
</tr>
<tr>
<td>Alignment</td>
<td>Position of a prosthetic socket in relation to foot and knee</td>
</tr>
<tr>
<td>Amputation</td>
<td>Removal of all or part of a limb due to infection, injury, tumour, disease or trauma</td>
</tr>
<tr>
<td>Amputee</td>
<td>A person who has had all or part of a removed/amputated or is born without a limb</td>
</tr>
<tr>
<td>BK</td>
<td>Below the knee</td>
</tr>
<tr>
<td>Traumatic amputation</td>
<td>A spontaneous removal of a limb for example as a result of an accident</td>
</tr>
<tr>
<td>Congenital limb deficiency</td>
<td>When all or parts of limb/s do not develop normally in the womb or are missing</td>
</tr>
<tr>
<td>Doffing</td>
<td>Taking the prosthesis off</td>
</tr>
<tr>
<td>Donning</td>
<td>Putting the prosthesis on</td>
</tr>
<tr>
<td>Edema</td>
<td>Swelling of the tissues (also spelt oedema)</td>
</tr>
<tr>
<td>Patella</td>
<td>Kneecap</td>
</tr>
<tr>
<td>Peripheral vascular disease</td>
<td>Disease of the blood vessels from a variety of causes</td>
</tr>
<tr>
<td>Phantom pain</td>
<td>Painful feeling in the part of the extremity that has been amputated</td>
</tr>
<tr>
<td>Prosthesis</td>
<td>A fabricated/artificial substitute for a body part that is missing</td>
</tr>
<tr>
<td>Prosthetic</td>
<td></td>
</tr>
<tr>
<td>Prosthetist</td>
<td>Someone who specialises in designing, fitting and making artificial limbs</td>
</tr>
<tr>
<td>Definitive, or “Permanent”</td>
<td>a replacement for a missing limb or part of a limb prostheses which meets accepted standards for comfort, fit, alignment, function, appearance and durability.</td>
</tr>
<tr>
<td>Preparatory fitted</td>
<td>an unfinished functional replacement for an amputated limb,</td>
</tr>
<tr>
<td>Prostheses</td>
<td>and aligned in accordance with the sound bio-mechanical principals, which is worn for a limited period of time to accelerate the rehabilitation process.</td>
</tr>
<tr>
<td>----------------------------------</td>
<td>--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Residual limb</td>
<td>The remaining part of the limb after amputation (the stump)</td>
</tr>
<tr>
<td>SACH foot</td>
<td>Solid Ankle Cushion Heel</td>
</tr>
<tr>
<td>Socket</td>
<td>The part of the prosthesis (artificial limb) that fits around the residual limb</td>
</tr>
<tr>
<td>Transradial Amputation</td>
<td>Below the elbow</td>
</tr>
<tr>
<td>Transfemoral Amputation (TF)</td>
<td>Amputation above the knee</td>
</tr>
<tr>
<td>Transmetatarsal-TM</td>
<td>Amputation through junction of toe and foot bones</td>
</tr>
<tr>
<td>Transtibial Amputation (TT)</td>
<td>Amputation below the knee</td>
</tr>
<tr>
<td>Transhumeral Amputation</td>
<td>Above the elbow Upper extremity Upper limb</td>
</tr>
<tr>
<td>Vascular Amputation</td>
<td>Amputation surgery performed as a result of impaired of blood through the blood vessels of the limb</td>
</tr>
</tbody>
</table>
APPENDIX G

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APPENDIX H

A MODERN BELOW KNEE PROSTHESSES
A Modern Below Knee Prostheses

- Sleeve
- Pylon
- Energy Storing Foot Spring
- Cosmetic Foot